# AS450 Series Common Vector Inverter Instruction Manual V1.0

Publication Status: Standard
Product Edition: V1.0

# Foreword

Thank you for purchasing AS450 series common vector inverter.

To ensure correct installation and use, please carefully read and understand the contents in the instruction prior to use.

## General Statement



## Content description

Supplement and modification may be made to the content of this instruction, please visit our company website regularly for update.

Website: www.stepelectric.com.

Contact address: if you have any doubt or problem during reading the manual, please contact us by the address on the back cover of this document.

# About Warranty

## Warranty period

Warranty period of the product will be 18 months from the date of leaving factory.

## Warranty scope

Fault diagnosis

Principally, the initial fault diagnosis will be executed by the user.

But as required by the user, STEP or its service network may provide the paid service.

At this time, if the fault is caused by STEP according to the result discussed by both parties, then the service is free.

Fault repair

If it needs to repair or replace the product according to the fault appeared, STEP may provide free onsite service. But the following will be paid services:

- Fault is caused by the improper storage, use or design of the user and its customer
- Fault is caused by the change privately made by the user when STEP doesn't understand it;
- Fault caused by the application of the product beyond its specification;
- Fault caused by the natural disaster or fire;
- Fault caused by any other reason other than STEP's responsibility.

## Beyond the guarantee responsibility

Any inconvenience brought to the user and its customer or damage to the product not from STEP due to the fault of STEP product will be not within the guarantee scope of STEP.

STEP won't undertake any responsibility for the associated loss.

CHAPTER 1 SAFETY NOTICE

CHAPTER 2 PRODUCT OVERVIEW

CHAPTER 3 INSTALLATION OF THE INVERTER

CHAPTER 4 WIRING OF THE INVERTER

CHAPTER 5 COMMISSIONING AND TEST RUN

CHAPTER 6 FUNCTIONAL PARAMETER TABLE

CHAPTER 7 PARAMETER DETAILS

CHAPTER 8 FAULT CHECK

CHAPTER 9 SERVICE AND MAINTENANCE

APPENDIX A INVERTER EMC INSTALLATION GUIDE

APPENDIX B STANDARD COMPATIBILITY

APPENDIX C MODBUS COMMUNICATION PROTOCOL

# Contents

**Chapter 1 Safety Notice ..... 1**

1.1 Safety-related Sign ..... 1
1.2 Safety Notes ..... 2
1.2.1 Usage ..... 2
1.2.2 Arrival Inspection ..... 2
1.2.3 Transportation and Storage ..... 2
1.2.4 Installation ..... 3
1.2.5 Electrical Wiring ..... 3
1.2.6 Test Run ..... 4
1.2.7 Maintenance and Inspection ..... 5
1.2.8 Disposal Treatment ..... 6
1.2.9 Accord with Low Voltage Directive ..... 6
1.2.10 Others ..... 6
1.3 Matters Needing Attention ..... 7
1.3.1 Motor Insulation Inspection ..... 7
1.3.2 Thermal Protection of the Motor ..... 7
1.3.3 Heating and Noise of the Motor ..... 7
1.3.4 Notices for Input and Output ..... 7
1.3.5 Use Beyond the Rated Voltage Value ..... 8
1.3.6 Lightning Surge Protection ..... 8
1.3.7 Leakage Protection ..... 8
1.3.8 Use of Decreasing ..... 8
1.3.9 Adaptive Motor ..... 8

**Chapter 2 Product Overview ..... 11**

2.1 Nameplate Description ..... 11
2.1.1 Description of Inverter Nameplate ..... 11
2.1.2 Product (order No.) Description ..... 12
2.1.3 Description of Product Specification ..... 12
2.2 Technical Indicator and Specification of Inverter ..... 13
2.3 Installation Simensions of the Inverter ..... 16
2.3.1 Product Appearance and Name of each Part ..... 16
2.3.2 Product Boundary Dimension and Mounting Dimension ..... 18
2.3.3 Operator Dimension ..... 20
2.4 Selection of Braking Unit and Braking Resistor ..... 21

**Chapter 3 Installation of the Inverter ..... 25**

3.1 Installation Steps ..... 25
3.2 Mechanical Installation ..... 25
3.2.1 Installation Environment of the Product ..... 25

3.2.2 Installation Position and Space Requirement ..... 26
3.2.3 Inverter Installation ..... 28
3.3 Installation and Disassembling of the Operator and Panel ..... 29
3.3.1 Connect/Disconnect the Operator ..... 29
3.3.2 Open/Close Wiring Cap ..... 29
3.3.3 Install and Disassemble Front Panel ..... 30

**Chapter 4 Wiring of the Inverter ..... 31**

4.1 Connect Inverter to Peripherals ..... 32
4.1.1 Connection Diagram between Inverter and Peripherals ..... 32
4.1.2 Connect Inverter to Peripherals ..... 32
4.2 Wiring of Inverter Terminals ..... 42
4.2.1 Wiring Diagram of the Inverter Terminals ..... 43
4.2.2 Terminal wiring precaution ..... 45
4.3 Main Circuit Terminal Wiring ..... 45
4.3.1 Line-up of Main Circuit Terminals ..... 45
4.3.2 Main Circuit Terminal Label and Function Specification ..... 46
4.3.3 Main Circuit Wire Specification ..... 46
4.3.4 Detailed Wiring Description for Terminals of the Main Loop ..... 48
4.4 Anti-interference Measures ..... 53
4.4.1 Connect Specific Noise Filter at Output ..... 53
4.4.2 Surge Suppressor at Output Side ..... 53
4.4.3 Wiring Arrangement of the Main Loop ..... 53
4.4.4 Proper Method against Interference ..... 54
4.4.5 Relationship between Length of Wire and Carrier Frequency ..... 54
4.5 Control Circuit Terminal Wiring ..... 55
4.5.1 Line-up of Control Circuit Terminals ..... 55
4.5.2 Control Circuit Terminal Label ..... 56
4.5.3 Functional Description for Terminals of the Control Circuit ..... 56
4.5.4 Control Circuit Wire Specification ..... 59
4.5.5 Detailed Wiring Description for Terminals of the Control Loop ..... 59
4.5.6 Other Remarks for Wiring ..... 64
4.6 The Wiring of PG Card Terminals ..... 64
4.6.1 PG Card Incremental ABZ ..... 64
4.6.2 RESOLVER PG Card ..... 66
4.6.3 Precaution for PG Card Terminal Wiring ..... 67

**Chapter 5 Commissioning and Test Run ..... 69**

5.1 Run Command Given ..... 69
5.1.1 Run Command Channel of the Inverter ..... 69
5.1.2 Frequency Given Channel of the Inverter ..... 70
5.1.3 Working Status of the Inverter ..... 70
5.1.4 Run Mode of the Inverter ..... 70
5.2 Operation Guide ..... 70
5.2.1 Function for Individual Parts of the Operator ..... 71

5.2.2 LED Indicator ..... 71
5.2.3 LED Digital Tube ..... 72
5.2.4 LCD Display ..... 72
5.2.4 Keyboard ..... 72
5.3 Operation ..... 72
5.3.1 Power On and Initialization ..... 73
5.3.2 Display After Power On ..... 73
5.3.3 【Monitor State】 In Detail ..... 73
5.3.4 【Control Panel】 In Detail ..... 74
5.3.5 Operation Mode ..... 75
5.4 Fast Commissioning for V/F Control ..... 78
5.5 Fast Commissioning for Vector Control ..... 79
5.6 Operation Example ..... 82
5.7 Fault Display ..... 82

**Chapter 6 Functional Parameter Table ..... 85**

6.1 Introduction to Function Code Parameters Table ..... 85
6.2 Simple Table of Function Code Parameters ..... 85
6.2.1 Group P0X User Parameters ..... 85
6.2.2 Group P1X Control Parameters ..... 85
6.2.3 Group P2X Motor Parameters ..... 90
6.2.4 Group P3X Digital Parameters ..... 95
6.2.5 Group P4X Speed Control Parameters ..... 98
6.2.6 Group P5X Process Control Parameters ..... 100
6.2.7 Group P6X Vector Control Parameters ..... 103
6.2.8 Group P7X Enhanced Control Parameters ..... 105
6.2.9 Group P8X Communication Parameters ..... 110
6.2.10 Group P9X Fault and Display Parameters ..... 111
6.3 User Parameters Record Sheet ..... 115

**Chapter 7 Parameter Details ..... 117**

7.1 Introduction to the Main Menu ..... 117
7.1.1 Parameter Setting ..... 117
7.1.2 Motor Tuning ..... 117
7.1.3 Fault Check ..... 117
7.1.4 Parameter Processing ..... 118
7.2 Classification and Format of Parameter Groups ..... 119
7.2.1 Format of Parameter Groups ..... 119
7.2.2 Zoning of Parameter Groups ..... 119
7.3 Group P0X User Parameter Groups ..... 120
7.3.1 Group P00 Basic Function Parameters ..... 120
7.3.2 Group P01～09 User Function Parameter ..... 121
7.4 Group P1X Control Parameter Groups ..... 121
7.4.1 Group P10 Basic Control Parameters ..... 121
7.4.2 Group P11 Start Control Parameter ..... 126

7.4.3 Group P12 Parking Control Parameters ..... 130
7.4.4 Group P13 Braking Function V/F Control Parameters ..... 132
7.4.5 Group P14 V/F control Parameters ..... 133
7.5 Group P2X Motor Parameter Groups ..... 134
7.5.1 Group P20 Basic Motor Parameters ..... 134
7.5.2 Group P21 Advanced Motor Parameters ..... 135
7.5.3 Group P22 Motor Auxiliary Parameters ..... 137
7.5.4 Group P23 Motor Protection Parameters ..... 138
7.6 Group P3X Terminal Parameter Groups ..... 138
7.6.1 Group P30 Digital Input Parameters ..... 138
7.6.2 Group P31 Digital Output Parameters ..... 142
7.6.3 Group P32 Analog Input Parameters ..... 149
7.6.4 Group P33 Analog Output Parameters ..... 150
7.7 Group P4X Speed Parameter Groups ..... 152
7.7.1 Group P40 Basic Speed Parameters ..... 152
7.7.2 Group P41 Digital Multi-speed Parameters ..... 153
7.8 Group P5X Process Control Parameter Groups ..... 155
7.8.1 Group P50 Process Open Loop Parameters ..... 155
7.8.2 Group P51 Process Close Loop Parameters ..... 157
7.9 Group P6X Vector Control Parameter Groups ..... 161
7.9.1 Group P60 Speed Control Parameters ..... 161
7.9.2 Group P61 Current Control Parameters ..... 163
7.9.3 Group P62 Torque Control Parameters ..... 163
7.9.4 Group P63 Torque Compensation Parameters ..... 163
7.9.5 Group P64 Position Control Parameters (spare) ..... 164
7.10 Group P7X Enhanced Control Parameter Groups ..... 164
7.10.1 Group P70 Limit and Protection Parameters ..... 164
7.10.2 Group P71 Control Optimization Parameters ..... 167
7.11 Group P8X Communication Parameter Groups ..... 173
7.11.1 Group P80 Communication Selection Parameters ..... 173
7.11.2 Group P81 Modbus Communication Parameters ..... 173
7.11.3 Group P82 Profibus_DP Communication Parameters ..... 174
7.12 Group P9X Fault and Display Parameter Groups ..... 175
7.12.1 Group P90 Language Selection Parameters ..... 175
7.12.2 Group P91 LCD Display Parameters ..... 175
7.12.3 Group P92 LED Display Parameters ..... 176
7.12.4 Group P93 Running Record Parameters ..... 176
7.12.5 Group P94 Troubleshooting Parameters ..... 177
7.12.6 Group P95 Product Identification Parameters ..... 179
7.12.7 Group P96 Inverter Product Parameters ..... 180

**Chapter 8 Fault Check ..... 181**

8.1 The Function of Protection and Check ..... 181
8.2 Fault Diagnosis Flow Chart ..... 188

**Chapter 9 Service and Maintenance ..... 191**

9.1 Warranty ..... 191
9.2 Product Inquiry ..... 191
9.3 Routine Check ..... 192
9.4 Periodic Check ..... 192

**Appendix A Inverter EMC Installation Guide ..... 195**

A.1 Noise Suppression ..... 195
A.1.1 Types of Noise ..... 195
A.1.2 Noise Transmission Route ..... 195
A.1.3 Basic Method for Noise Suppression ..... 196
A.2 Wiring Requirement ..... 197
A.2.1 Requirement for Cable Laying ..... 197
A.2.2 Requirement for Cable Cross Section Area ..... 197
A.2.3 Requirement for Shielded Cable ..... 198
A.2.4 Installation Requirement for Shielded Cable ..... 198
A.3 Grounding ..... 198
A.3.1 Type of Grounding ..... 198
A.3.2 Precaution for Ground Wiring ..... 199
A.4 Surge Absorber Installation ..... 199
A.5 Leakage Current and Its Solution ..... 200
A.5.1 Ground Leakage Current ..... 200
A5.2 Cable Inter-line Leaking ..... 200
A.6 Radiation Suppression ..... 200
A.7 Power Cable Filter Guide ..... 202
A.7.1 Function of Power Cable Filter ..... 202
A.7.2 Precaution for Power Cable Filter Installation ..... 202
A.8 Installation Section Divide for EMC Inverter ..... 202
A.9 Precaution for Electrical Installation ..... 204
A.10 EMC Standard Fulfilled by AS450 Series Inverter ..... 205

**Appendix B Standard Compatibility ..... 207**

**Appendix C Modbus Communication Protocol ..... 209**

C.1 Command Data [registers 3 and 6] [bits 1 and 5] ..... 209
C.2 Monitoring Data [register 4] [bit 2] ..... 212

**Customer Complaint ..... 221**

**Product Warranty Card ..... 223**

**Warranty Agreement ..... 224**

**Notice to Customers ..... 225**

# Chapter 1 Safety Notice

This section covers the safety notice and matters needing attention during use of AS450 inverter, including sign description, usage, arrival confirmation, transportation and storage, installation, wiring safety notice, commissioning/operation, fault overhaul and product disposal treatment etc. relating to safety. To ensure personal safety and lengthen the service life of equipment and its connecting device, please be sure to read the following safety rules and warnings as well as all warning marks attached to the equipment before installation and commissioning. Please carefully read this information.

## 1.1 Safety-related Sign

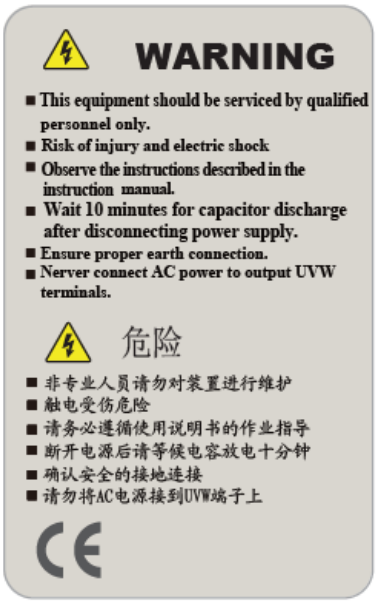
All safety related contents in this manual are marked following labels. All contents attached with these safety signs are important and must be followed strictly.

**Danger** Indicates a hazardous situation, if a mistake operation could result in death or serious injury.

**Notice** Indicates a hazardous situation, if a mistake operation could result in minor or severe injury and equipment trouble.

**Important** Need to be followed and pay greater attention.

In addition, even if **Notice** matters, according to the specific situation, sometimes also can lead to major accidents.



## 1.2 Safety Notes

### 1.2.1 Usage

**Danger**

This series inverter is used to control the operation of three-phase motor at variable speed, other than single-phase motor or other purposes, otherwise inverter fault or fire may be caused.

This series inverter can't be simply applied on the occasions directly related to personal safety, such as medical device.

This series inverter is produced under the strict quality management system. If any serious accident or loss may be caused by its fault, safety measures such as redundancy or bypass shall be provided.

### 1.2.2 Arrival Inspection

**Notice**

The product delivered must be in perfect condition and completely consistent with the information on the order form. If the product is damaged or inconsistent with the information on the order form, please contact your local distributor or agent or manufacturer.

If the equipment delivered has any damage or missing part, it shall not be installed or put into operation, otherwise it may cause accident.

### 1.2.3 Transportation and Storage

**Notice**

Avoid violent vibration or impact during transportation.

If any equipment damage is found, it must be informed to the transport company.

Equipment transportation and storage must satisfy the specified ambient conditions.

If the device is stored for more than 1 year, then the capacitor must be recharged.

### 1.2.4 Installation

**Danger**

Be careful of fire or electric shock.

Don't install the equipment in the flammable and combustible areas or those with water or corrosive danger.

**Notice**

Please hold the product bottom during handling and installation, to avoid crush or break the inverter.

Don't install the equipment in the areas which are easily affected by continuous vibration, shock or electromagnetic interference.

The inverter must be installed on the flame retardant object such as metal, and keep away from the flammable material or heat.

Be careful of fire! To ensure no foreign matters (sawdust, scrap iron, dust or paper scrap) inside the inverter or on its radiator.

A certain space must be provided between inverter and inverter, inverter and inner wall of another equipment/electrical cabinet. (Refer to Installation Location and Spacing for the details).

Horizontal installation is prohibited.

### 1.2.5 Electrical Wiring

**Danger**

Wiring must be executed by the qualified electrical engineering staff, otherwise electric shock or inverter damage may be caused.

Power supply must be disconnected prior to wiring, otherwise electric shock or fire may be caused.

Ground terminal PE must be reliably grounded, otherwise the inverter casing may be electrified.

Don't touch the main loop terminal, which shall not contact the casing, otherwise it may cause electric shock.

Turn on the power supply when the run signal is connected, then the motor will run automatically, then please confirm the power supply is connected after the run signal is disconnected. Otherwise personal injury may be caused.

For 3-wire system sequential control, wiring can be executed for the control loop after parameters of multifunctional input terminals are set, otherwise personal injury may be caused due to motor rotation.

### 1.2.6 Test Run

## Notice

Be sure not to connect the power input cable to motor terminals U/T1, V/T2 and W/T3, nor motor cable to the power supply input terminals R/L1, S/L2 and T/L3.

Power line and signal line must be laid in different troughs, with minimum space 30cm between them. The cable connected can't touch any rotating mechanical part.

Capacitor or LC/RC noise filter with phase advance isn't permitted to connect to the output end of the inverter, otherwise internal components of the inverter may be damaged.

Wiring cable of the main loop terminal shall be provided with crimp terminals with insulating bush.

Selection of input and output cable of the inverter, choose the cable with proper section according to inverter power.

If the cable length between inverter and motor exceeds 100m or running with several motors, it suggests use output reactor, to avoid overcurrent due to too large capacitance distributed, so as to produce inverter fault.

Be sure not to use the load other than 3-phase AC motor.

Please ensure to take off the load when executing rotating self-learning. The motor will run and stop repeatedly before the self-learning is completed, therefore don't touch it, otherwise personal injury may be caused.

## Danger

Please ensure to turn on the power supply after the front outer cover has been installed. Don't remove the outer cover when the power supply is turned on, otherwise electric shock may be caused.

Please prepare the emergency stop switch additionally (stop button is effective only when function setting is executed).

Please ensure reset alarm after run signal is switched off, otherwise personal injury may be caused.

## ⚠ Notice

Be sure to have motor no-load commissioning first, and then motor load commissioning. Don't touch the radiator, motor or other high temperature part when the equipment is running or within a period of time after the equipment is disconnected, to avoid scald.

Don't start or stop the inverter by means of connecting or disconnecting the power supply repeatedly, otherwise it will damage the equipment/system.

Prior to running, please ensure that the motor and machine are within the permissible range of application, otherwise equipment damage may be caused.

When it is used with the lifting equipment, mechanical brake device will be provided at the same time.

Don't change the inverter parameters at will, most of the factory set parameters of the inverter are able to satisfy the running requirement, only to set some necessary ones. Random modification may cause mechanical damage.

### 1.2.7 Maintenance and Inspection

## ⚠ Danger

There are HV terminals in the inverter, don't touch them randomly, otherwise electric shock may be caused.

Be sure to install the protective cover when the equipment is electrified. In addition, when remove the protective cover, be sure to disconnect the circuit breaker for wiring, otherwise electric shock may be caused.

After power supply of the main loop is cut off, please wait for 10 min at least, then execute maintenance and inspection only after the charge indicator of the outer cover went off, otherwise electric shock may be caused due to the residual voltage on the capacitor.

Except for the appointed staff, don't execute maintenance, inspection or replacement operation by others. Prior to these operations, please take off the metal ornaments (watch, ring, etc). During operation, please use the tools treated with insulation, otherwise electric shock may be cause.

**Notice**

Don't touch the circuit board because there is CMOS large scale integrated circuit, to avoid damage to the board.

### 1.2.8 Disposal Treatment

**Danger**

Explosion may be caused when electrolytic capacitor of the main loop and that on the printed board is burning. Poisonous gas may be produced when plastic parts are burning. Disposal of the equipment must be based on the laws and regulations on processing the industrial electronic waste of the related environmental protection department.

### 1.2.9 Accord with Low Voltage Directive

**Danger**

Our products meet the standard of EN61800-5-1:2007, thus they are in accord with "Low Voltage Directive 2006/95/EC".

Make sure that the whole system meets EC requirement if this inverter is integrated in the whole electrical system as a component.

Please note:

①To ensure that machine is grounded, and the ground terminal block is grounded separately

②Prohibit to ground inverter at △, and use IT power

③To ensure that the cabinet is grounded if inverter is installed in it

④Use CE certified breaker, electromagnetic contactor and other components. Type B leakage current circuit breaker is required

The protection level of this inverter is class 1. And please use it under the conditions as overvoltage Catalogue Ⅲ. 3, and pollution Degree Ⅱ.

### 1.2.10 Others

**Notice**

Don't place the inverter in the environment containing halogen (F, Cl, Br and I) under any circumstances of transportation or setting, otherwise inverter damage or parts burning may be caused.

## 1.3 Matters Needing Attention

### 1.3.1 Motor Insulation Inspection

The motor shall be executed with insulation inspection when it is used for the first time, reused after long time storage or regular inspection, to avoid inverter damage due to insulation failure of motor winding. During insulation inspection, be sure to separate the motor wiring from the inverter, 500V megameter is recommended. Insulation resistance measured shall be below 5 MΩ.

### 1.3.2 Thermal Protection of the Motor

If the chosen motor doesn't match with the rated capacity of AS450 series inverter, especially rated power of the inverter is greater than that of the motor, please adjust the related motor protection parameters of AS450 or install a thermal relay in front of the motor, to protect the motor.

### 1.3.3 Heating and Noise of the Motor

The output voltage of the inverter is PWM wave, with a certain harmonic, therefore temperature rise, noise and vibration of the motor are slighted increased comparing to power frequency running.

When the ordinary motor runs at a low speed for a long time driven by the inverter, its cooling effect becomes poor, and its temperature will rise. If it needs to run at a low speed and constant torque for a long time, variable frequency motor must be chosen or forced air cooling shall be adopted.

### 1.3.4 Notices for Input and Output

The output of AS450 is PWM wave, if capacitor to improve power factor or voltage dependent resistor for lightning protection is installed on the output side, instant overcurrent or damage will be caused to the inverter. Don't use it.

Schematic diagram shows that output side of inverter can not connect capacitor. See Fig. 1-1.

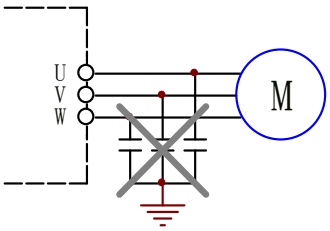



**Fig. 1-1 Capacitor cannot be connected to the output of inverter**

If a contractor is provided between the power supply and input end of the inverter, then it is prohibited to control start or stop of the inverter with this contactor.

If the switching elements such as contactor are provided between the output end and the motor, it shall ensure the inverter to have making-breaking operation without any output. The contactor won't be closed when the inverter is outputting, otherwise module damage is easily produced.

Start and stop of the inverter can be controlled by the terminal. Direct and frequent start and stop with the use of switching elements such as contactor on the input side of the inverter will be prohibited, otherwise equipment damage may be caused.

### 1.3.5 Use Beyond the Rated Voltage Value

If AS450 series inverter is used when the external voltage isn't within the permissible operating voltage scope specified in this manual, damage to the inverter components may be caused. If necessary, please use the related boosting or dropping device to have voltage change processing.

### 1.3.6 Lightning Surge Protection

This series inverter is provided with lightning surge protective device, with certain self-protection ability to the inductive thunder. The customer shall provide protection in front of the inverter at the places with frequent lightning.

### 1.3.7 Leakage Protection

High speed switch will work when the inverter is running, leading to high frequency leakage current, which will cause malfunction of the leakage protection circuit sometimes. When the above problem occurs, a leakage protector shall be correctly installed, besides carrier frequency reduction or lead shortening.

The followings must be noted during installation of the leakage protection circuit:

- Leakage protector must be set on the input side of the inverter, it is suitable to put it behind the air switch (non-fuse circuit breaker).
- Leakage protector shall adopt that not sensitive to higher harmonic or that dedicated to the inverter (sensitivity: 30mA above). If the ordinary leakage protector is applied, whose sensitivity shall be better than 200mA and actuation time shall be above 0.1s.

### 1.3.8 Use of Decreasing

When the ambient temperature exceeds 40℃, the inverter shall be decreased by 2% for temperature rise of every 1℃. And external forced cooling must be added.

In the areas where the altitude is greater than 1000m, cooling effect of the inverter will become poor due to thin air, the inverter shall be decreased by 1% for altitude rise of every 100m, the maximum altitude is 3000m;

When the carrier frequency set exceeds the factor setting, the inverter shall be decreased by 10% for frequency increase of every 1 kHz;

Please refer to our company for the details of decreasing.

### 1.3.9 Adaptive Motor

AC asynchronous motor is suitable for the inverter, please be sure to choose the inverter

according to motor nameplate.

Built-in default motor parameters of the inverter are asynchronous motor ones, but necessary motor parameter identification or default value modification shall be made according to the actual situation, to meet the actual value, otherwise operation effect and protective performance may be affected.

If short circuit appears inside the cable or the motor, the inverter will send an alarm or even be damaged, therefore insulation short circuit testing shall be made for the motor and cable initially installed, as well as during the daily maintenance. Please note that the inverter and the part to be tested must be disconnected completely during testing.

# Chapter 2 Product Overview

AS450 series is 400V (380V~460V) common vector inverter, and applies to 3-phase AC asynchronous motor with motor capacity 1.1~355kW. AS450 series inverter with factory default set provides the ideal solution for many simple motor control applications, it is also can be applied to more advanced motor control operation after the related parameters are set.

## 2.1 Nameplate Description

The nameplate is attached to the side of the inverter, with the model, specification, batch No. and manufacturing code, etc on it.

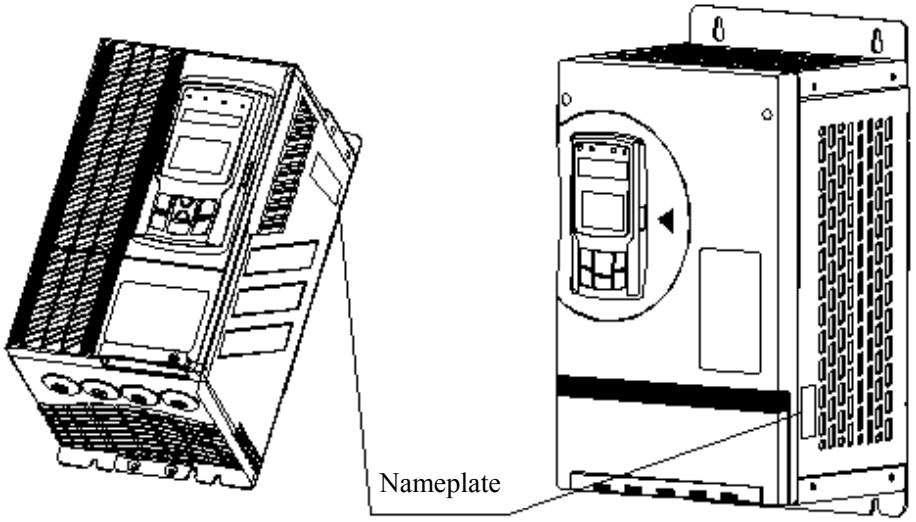



**Fig. 2-1 Inverter Nameplate (example)**

### 2.1.1 Description of Inverter Nameplate

Inverter nameplate, see Fig.2-2. Nameplate records the model, specification and lot number.

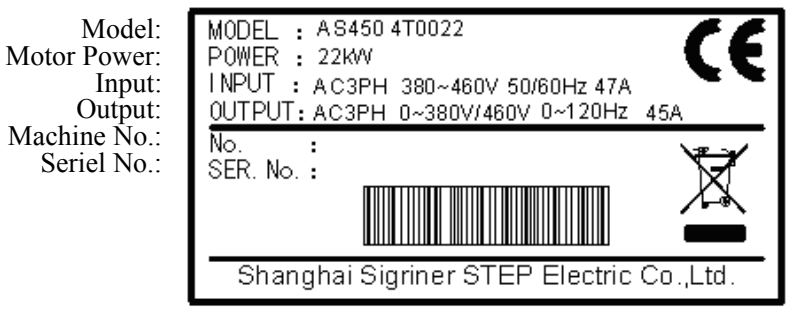



**Fig. 2-2 The description of the inverter nameplate**

## 2.1.2 Product (order No.) Description

In the column "inverter model" on the nameplate, specification, voltage grade, motor type and maximum power of the inverter are expressed in letters and numbers.

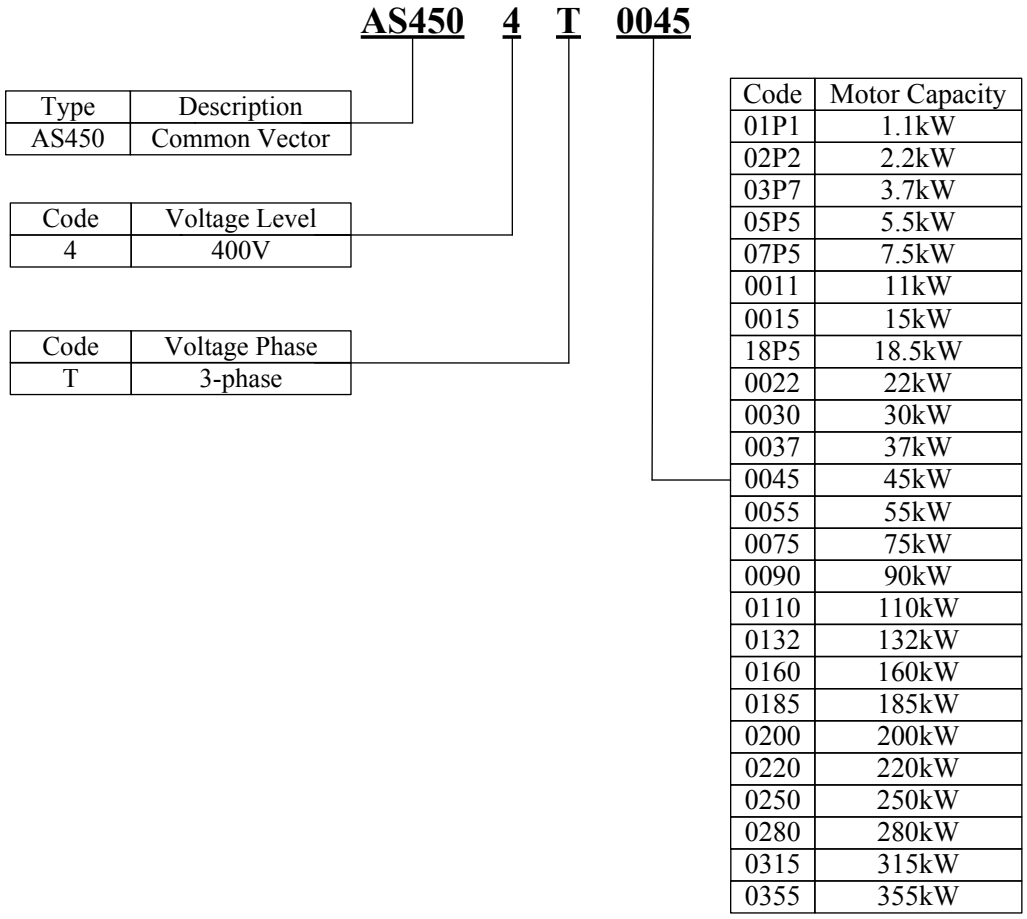



**Fig. 2-3 Description of inverter model**

## 2.1.3 Description of Product Specification

In the column "inverter specification" on the nameplate, voltage level and rated current value of the inverter are expressed in letters and numbers.

**Table 2.1 Inverter Specification Series**

| Stable operation at 40℃, heavy load | | | | |
|---|---|---|---|---|
| **Inverter model AS450** | **Rated input current (A)** | **Rated output current (A)** | **Adaptative motor (kW)** | **Overload 150% (1min)** |
| 4T01P1 | 3.7 | 3.5 | 1.1 | 5.3 |
| 4T02P2 | 6.6 | 6.2 | 2.2 | 9.3 |
| 4T03P7 | 9.5 | 9 | 3.7 | 13.5 |
| 4T05P5 | 12.7 | 12 | 5.5 | 18 |
| 4T07P5 | 18 | 17 | 7.5 | 25.5 |

| Stable operation at 40℃, heavy load | | | | |
|---|---|---|---|---|
| Inverter model AS450 | Rated input current (A) | Rated output current (A) | Adaptative motor (kW) | Overload 150% (1min) |
| 4T0011 | 26 | 25 | 11 | 36.5 |
| 4T0015 | 35 | 33 | 15 | 47.5 |
| 4T18P5 | 43 | 41 | 18.5 | 59.5 |
| 4T0022 | 47 | 45 | 22 | 67.5 |
| 4T0030 | 63 | 60 | 30 | 90 |
| 4T0037 | 73 | 70 | 37 | 105 |
| 4T0045 | 95 | 91 | 45 | 136.5 |
| 4T0055 | 117 | 112 | 55 | 168 |
| 4T0075 | 156 | 150 | 75 | 225 |
| 4T0090 | 187 | 180 | 90 | 270 |
| 4T0110 | 224 | 216 | 110 | 324 |
| 4T0132 | 269 | 260 | 132 | 390 |
| 4T0160 | 312 | 302 | 160 | 451 |
| 4T0185 | 383 | 370 | 185 | 555 |
| 4T0200 | 401 | 390 | 200 | 585 |
| 4T0220 | 438 | 426 | 220 | 639 |
| 4T0250 | 492 | 480 | 250 | 720 |
| 4T0280 | 532 | 520 | 280 | 780 |
| 4T0315 | 613 | 600 | 315 | 900 |
| 4T0355 | 663 | 650 | 355 | 975 |

**Notes:** 1. The maximum power of adaptative motor is the rated power of 4-pole 50Hz standard motor. During the actual application, nameplate of the motor must be examined, to ensure the inverter selected is match with the motor.

2. The above is the rated current under default carrier frequency, ≤15kW, carrier frequency 6kHz; <30kW, carrier frequency 5kHz, ≤55kW, carrier frequency 4kHz; ≤75kW, carrier frequency 3kHz; >75kW, carrier frequency 2kHz.

## 2.2 Technical Indicator and Specification of Inverter

| | | |
|---|---|---|
| Power input | Input voltage | 380V ~ 460V (-15% ~ +10%), 3-phase power supply |
| | Input frequency | 45 ~ 65Hz |
| | Permissible voltage variation | Voltage unbalance<3% |
| | Current harmonic | Built-in DC reactor for 30kW and above, with current harmonic <40% (full load)<br>Externally installed DC reactor for 30kW and below (optional) |
| | Transient voltage sag | 3-phase AC380V ~ 460V, inpout voltage<AC300V, under-voltage protection 15ms later. |

| | | |
|---|---|---|
| Power output | Voltage | 0VAC ~ input voltage |
| | Output frequency | V/F control: 0.00 ~ 300.00Hz<br>Vector control: 0.00 ~ 120.00Hz |
| | Overload grade | Stable operation under 40℃, heavy load 150%, 1min |
| | Efficiency (full load) | ≥0.94 |
| | Output frequency precision | ±0.01% (digital command-10 ~ +45℃)<br>±0.1% (analog command 25±10℃) |

| | | |
|---|---|---|
| Digital I/O | Optoelectronic isolated input | 7 optoelectronic isolated inputs, 24V, either high or low level is effective, which is settable. Input functions can be defined. |
| | Open collector output | 2 open collector outputs, output functions can be defined |
| | Relay output | 2 relay outputs with normally open contact, contact capacity: inductive, 1.5A/250VAC, output functions can be defined.<br>2 relay outputs with normally open and close double contact, contact capacity: resistive, 4.5A/250VAC or 4.5A/30VDC; inductive: 0.4A/250VAC or 0.4A/30VDC; output functions can be defined. |

| | | |
|---|---|---|
| Analog I/O | Analog input | 2 analog inputs, precision 0.1%:<br>Voltage: -10V ~ +10VDC or current: 0~20mA optional signal |
| | Analog output | 2 analog outputs, precision 0.1%:<br>Voltage: -10V ~ +10VDC or current: 0~20mA optional signal |

| | | |
|---|---|---|
| Encoder input | PG power | 5V, 12V, 300mA |
| | PG signal | Open collector, push-pull, differential, SIN/COS increment type, Endat absolute value type and Resolver type |
| | PG frequency dividing output | Quadrature open collector output, frequency dividing factor 2/4/8/16/32/64/128 is settable (optional) |

| | | | | |
|---|---|---|---|---|
| Control character-istics | Control mode | V/F control | Open loop vector control | Closed loop vector |
| | Starting torque | 2.50Hz, 150% | 0.5Hz, 150% | 0.00Hz, 150% |
| | Speed regulation range | 1:50 | 1:200 | 1:1000 |
| | Speed stabilizing precision | ± 2% | ± 0.2% | ± 0.02% |
| | Torque precision | ±5% (closed loop control) | | |
| | Carrier frequency | 1.1~8kHz; automatically adjust the carrier frequency according to load characteristic | | |
| | Frequency set resolution | 0.01Hz (digital command)<br>±0.06Hz/120Hz (analog command 11 bit + unsigned) | | |
| | Run command channel | Operation panel reference, control terminal reference and communication reference | | |

| | | |
|---|---|---|
| | Frequency reference channel | Operation panel reference, digital/analog reference, communication reference and functional function reference |
| | Torque lifting | Automatic and manual torque lifting |
| | V/F curve | The user defines V/F curve, linear V/F curve and 3 reduced torque characteristic curves. |
| | Automatic voltage regulation | Automatically regulate the duty cycle of output PWM signal according to fluctuation of bus voltage, so as to relieve the influence of the voltage fluctuation of grid on the output voltage fluctuation. |
| | Continuous operation under transient outage | Realize continuous operation by controlling the bus voltage during instantaneous power failure. |
| | Dynamic braking capacity | Built-in braking unit for 22kW and below, with braking resistor externally (optional)<br>Externally installed braking unit for 22kW and above (optional) |
| | DC braking capacity | Braking current: 0.0 ~ 120.0% rated current |

| | | |
|---|---|---|
| Special functions | Parameter copy | The standard operation panel could upload, download the parameters, and indicate copy progress. |
| | Process PID | Closed loop control for quantity of process. |
| | Torque control function | Realize torque/speed control by terminal switching, multi-torque given way |
| | Zero servo function | Lock the zero-speed position, accurately positioning and position control |
| | Common DC bus | Realize the common DC bus power supply for several inverters |

| | |
|---|---|
| Motor protection | Blocked rotor |
| | Motor overload |
| | Motor overheat (PTC) |
| | Speed limitation |
| | Torque limitation |

| | |
|---|---|
| Inverter protection | Output current amplitude limiting |
| | Torque limitation |
| | Inverter overload |
| | IGBT $I^2t$ overload |
| | Input power undervoltage/overvoltage |
| | DC bus undervoltage/overvoltage |
| | IGBT overheat |
| | Radiator overheat |
| | Power failure |
| | Abnormal +10V power output |
| | Analog input signal loss (speed reference value loss) |
| | Abnormal communication |
| | Connecting failure for encoder |

| | |
|---|---|
| | Self-tuning failure |

| | | |
|---|---|---|
| Ambient conditions | Place of service | Vertically installed inside the electrical control cubicle with good ventilation. Horizontal or other installation is not permitted. Cooling medium is air. It is installed in the environment free from direct sunshine, dust, corrosive gas, combustible gas, oily mist, steam and dripping water. |
| | Ambient temperature | -10 ~ +40℃ |
| | Temperature derating use | >40℃, the rated output current decreases by 2% if the temperature increases every 1℃ (maximum 50℃) |
| | Altitude | <1000m |
| | Altitude derating use | >1000m, the rated output current decreases by 1% if the altitude increases every 100m (maximum 3000m) |
| | Ambient humidity | 5 ~ 95%, without condensation |
| | Vibration (transportation) | 2≤f＜9Hz 3.5mm; 9≤f＜200Hz, 10 $m/s^2$; 200≤f＜500Hz, 15 $m/s^2$ |
| | Vibration (installation) | 2≤f＜9 0.3mm; 9≤f＜200Hz, 1$m/s^2$ |
| | Storage temperature | -40 ~ +70℃ |
| | Protection degree | IP20 |

| | | |
|---|---|---|
| Control panel | Type | Movable |
| | Length | 1m (it can be customized, maximum 5m) |
| | Connection | RJ45 |
| | Text display | 4 lines |
| | LED display | 4-bit |
| | Visual LED indicator | 4 |
| | Key | 9 |

| | | |
|---|---|---|
| Others | Cooling mode | Forced air cooling |
| | Installation way | Inside the cubicle |
| | Certification | CE |

## 2.3 Installation Simensions of the Inverter

### 2.3.1 Product Appearance and Name of each Part

Refer to Fig. 2-4, Fig. 2-5 and Fig. 2-6 for appearance of the inverter and name of each part.

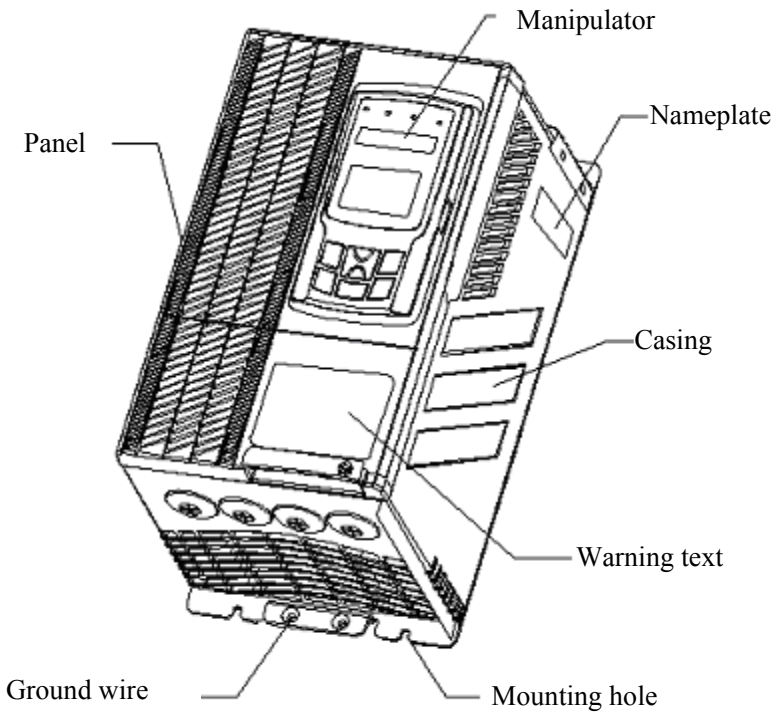



**Fig. 2-4 AS450 4T05P5 and below**

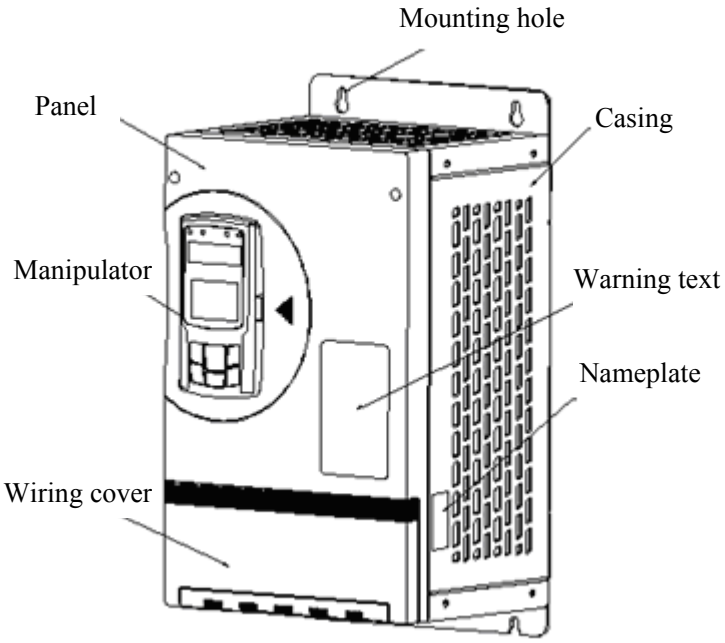



**Fig. 2-5 AS450 4T07P5~4T0022 power level**

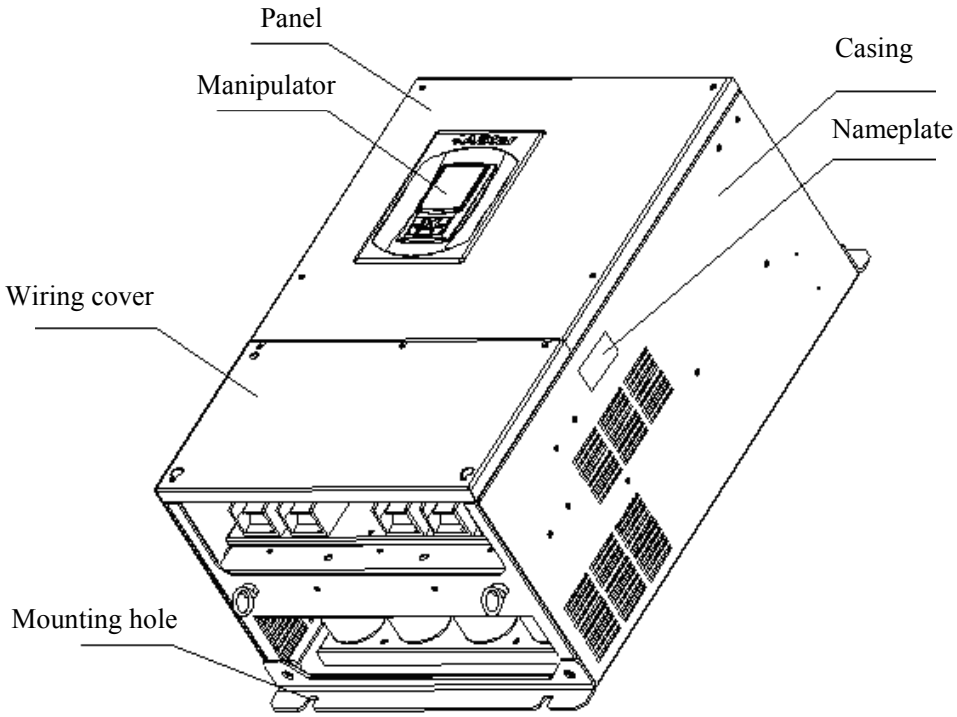



**Fig. 2-6 AS450 4T0030~4T0355 power level**

## 2.3.2 Product Boundary Dimension and Mounting Dimension

2.3.2.1 A1 Specification and Dimension

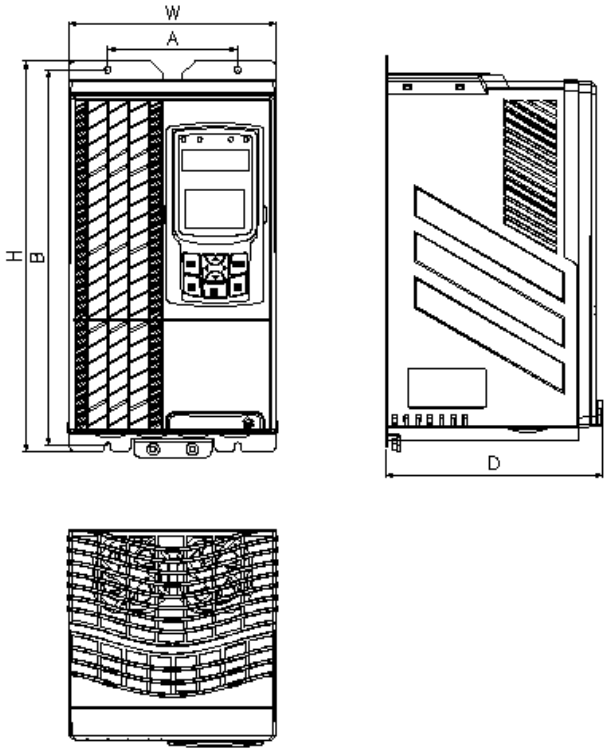



**Fig. 2-7 Installation dimensions of AS450 4T01P1~4T05P5**

| Specifi-cations | Model AS450 | A (mm) | B (mm) | H (mm) | W (mm) | D (mm) | Installing Diameter Φ(mm) | Installation | | | Tightening torque (Nm) | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Bolt | Nut | Washer | | |
| 1 | 4T01P1 | 100 | 288.5 | 300 | 160 | 162 | 5.0 | 4M4 | 4M4 | 4Φ4 | 1.1 | 4.5 |
| | 4T02P2 | | | | | | | | | | | |
| | 4T03P7 | | | | | | | | | | | |
| | 4T05P5 | | | | | | | | | | | |

2.3.2.2 A2~A8 Specification and Dimension

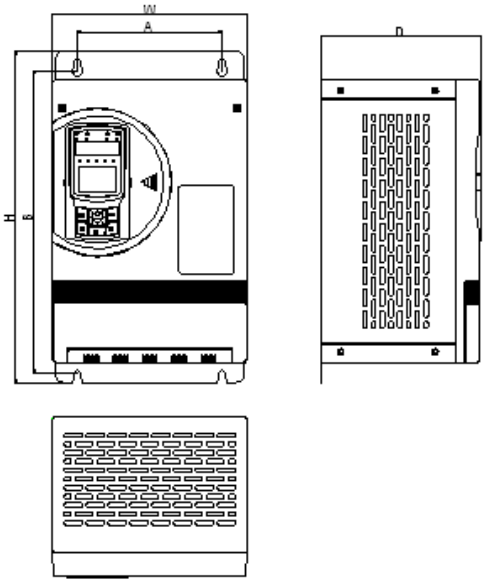



**Fig. 2-8 Installation dimensions of AS450 4T07P5~4T0022**

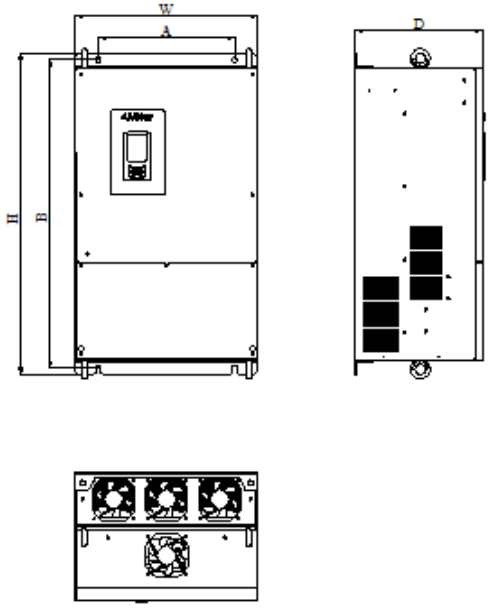



**Fig. 2-9 Installation dimensions of AS450 4T0030~4T0355**

| Specific-ations | Model AS450 | A (mm) | B (mm) | H (mm) | W (mm) | D (mm) | Installing Diameter Φ(mm) | Installation | | | Tightening torque (Nm) | Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Bolt | Nut | Washer | | |
| A2 | 4T07P5 | 165.5 | 357 | 379 | 222 | 182 | 7.0 | 4M6 | 4M6 | 4Φ6 | 3.5 | 8 |
| | 4T0011 | | | | | | | | | | | |
| A3 | 4T0015 | 165.5 | 392 | 414 | 232 | 182 | | | | | | 10.3 |
| | 4T18P5 | | | | | | | | | | | |
| | 4T0022 | | | | | | | | | | | |
| A4 | 4T0030 | 200 | 512 | 530 | 330 | 288 | 9.0 | 4M8 | 4M8 | 4Φ8 | 9 | 29.5 |
| | 4T0037 | | | | | | | | | | | |
| A5 | 4T0045 | 200 | 585 | 610 | 330 | 310 | | | | | | 38 |
| | 4T0055 | | | | | | | | | | | |
| A6 | 4T0075 | 320 | 718 | 750 | 430 | 350 | 13.0 | 4M12 | 4M12 | 4Φ12 | 29 | 79.5 |
| | 4T0090 | | 768 | 800 | | | | | | | | 81 |
| | 4T0110 | | | | | | | | | | | |
| A7 | 4T0132 | 374 | 844 | 880 | 500 | 352 | | | | | | 106.5 |
| | 4T0160 | | | | | | | | | | | |
| | 4T0185 | | | | | | | | | | | |
| | 4T0200 | | | | | | | | | | | 112.5 |
| | 4T0220 | | | | | | | | | | | |
| A8 | 4T0250 | 500 | 997 | 1030 | 630 | 370 | 14.0 | 4M12 | 4M12 | 4Φ12 | 29 | 168 |
| | 4T0280 | | | | | | | | | | | |
| | 4T0315 | | | | | | | | | | | 169 |
| | 4T0355 | | | | | | | | | | | 170 |

### 2.3.3 Operator Dimension

Fig. 2-10 shows the dimensions of the operator.

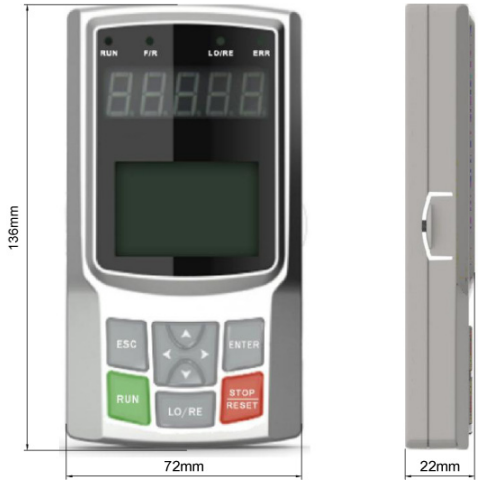



**Fig. 2-10 The dimension of the inverter Operator**

## 2.4 Selection of Braking Unit and Braking Resistor

Negative torque maybe appear when the motor is running under braking. Therefore braking component will be considered for the inverter, otherwise overcurrent or overvoltage will occur, leading to tripping. AS450 series inverter with 22kW and below is provided with built-in braking unit, only braking resistor externally provided; while 22kW and above is the externally installed braking unit, it is recommended to choose the optional braking unit and braking resistor, whose specification and quantity will be different based on the different ratio occupied by braking time within a braking period.

When braking time occupied within a braking period is 10%, configuration of the externally installed braking unit and braking resistor is shown as Table 2-2.

**Table 2-2 Configuration table for 400V braking unit and braking resistor**

| Inverter model AS450 | Inverter capacity (kW) | Braking unit | | Braking resistor (Utilization rate 10%) | |
|---|---|---|---|---|---|
| | | Specification | Qty. (pcs) | Specification of equivalent braking resistor | Qty. (pcs) |
| 4T01P1 | 1.1 | Built-in | | 260W 400Ω | 1 |
| 4T02P2 | 2.2 | | | 260W 250Ω | 1 |
| 4T03P7 | 3.7 | | | 390W 150Ω | 1 |
| 4T05P5 | 5.5 | | | 520W 100Ω | 1 |
| 4T07P5 | 7.5 | | | 780W 75Ω | 1 |
| 4T0011 | 11 | | | 1040W 50Ω | 1 |
| 4T0015 | 15 | | | 1560W 40Ω | 1 |
| 4T18P5 | 18.5 | | | 4800W 32Ω | 1 |
| 4T0022 | 22 | | | 4800W 27.2Ω | 1 |
| 4T0030 | 30 | BKU-4030 | 1 | 6000W 20Ω | 1 |

| Inverter model AS450 | Inverter capacity (kW) | Braking unit | | Braking resistor (Utilization rate 10%) | |
|---|---|---|---|---|---|
| | | Specification | Qty. (pcs) | Specification of equivalent braking resistor | Qty. (pcs) |
| 4T0037 | 37 | BKU-4045 | 1 | 9600W 16Ω | 1 |
| 4T0045 | 45 | BKU-4045 | 1 | 9600W 13.6Ω | 1 |
| 4T0055 | 55 | BKU-4030 | 2 | 6000W 20Ω | 2 |
| 4T0075 | 75 | BKU-4045 | 2 | 9600W 13.6Ω | 2 |
| 4T0090 | 90 | BKU-4110 | 1 | 18kW 6.7Ω | 1 |
| 4T0110 | 110 | BKU-4110 | 1 | 25kW 5Ω | 1 |
| 4T0132 | 132 | BKU-4220 | 1 | 40kW 3.4Ω | 1 |
| 4T0160 | 160 | BKU-4220 | 1 | 40kW 3.4Ω | 1 |
| 4T0185 | 185 | BKU-4220 | 1 | 40kW 3.4Ω | 1 |
| 4T0200 | 200 | BKU-4220 | 1 | 48kW 3Ω | 1 |
| 4T0220 | 220 | BKU-4220 | 1 | 48kW 3Ω | 1 |
| 4T0250 | 250 | BKU-4110 | 2 | 25kW 5Ω | 2 |
| 4T0280 | 280 | BKU-4220 | 2 | 40kW 3.4Ω | 2 |
| 4T0315 | 315 | BKU-4220 | 2 | 40kW 3.4Ω | 2 |
| 4T0355 | 355 | BKU-4220 | 2 | 40kW 3.4Ω | 2 |

When braking time occupied within a braking period is 20%, configuration of the externally installed braking unit and braking resistor is shown as Table 2-3.

**Table 2-3 Configuration table for 400V braking unit and braking resistor**

| Inverter model AS450 | Inverter capacity (kW) | Braking unit | | Braking resistor (Utilization rate 20%) | |
|---|---|---|---|---|---|
| | | Specification | Qty. (pcs) | Specification of equivalent braking resistor | Qty. (pcs) |
| 4T01P1 | 1.1 | Built-in | | 520W 350Ω | 1 |
| 4T02P2 | 2.2 | | | 520W 230Ω | 1 |
| 4T03P7 | 3.7 | | | 780W 140Ω | 1 |
| 4T05P5 | 5.5 | | | 1040W 90Ω | 1 |
| 4T07P5 | 7.5 | | | 1560W 70Ω | 1 |
| 4T0011 | 11 | | | 2kW 47Ω | 1 |
| 4T0015 | 15 | | | 3kW 34Ω | 1 |
| 4T18P5 | 18.5 | | | 9600W 28Ω | 1 |
| 4T0022 | 22 | | | 9600W 24Ω | 1 |
| 4T0030 | 30 | BKU-4045 | 1 | 12.5kW 17Ω | 1 |
| 4T0037 | 37 | BKU-4045 | 1 | 20kW 15Ω | 1 |
| 4T0045 | 45 | BKU-4030 | 2 | 10kW 24Ω | 2 |
| 4T0055 | 55 | BKU-4045 | 2 | 12.5kW 18Ω | 2 |
| 4T0075 | 75 | BKU-4110 | 1 | 36kW 6.7Ω | 1 |

| Inverter model AS450 | Inverter capacity (kW) | Braking unit | | Braking resistor (Utilization rate 20%) | |
|---|---|---|---|---|---|
| | | Specification | Qty. (pcs) | Specification of equivalent braking resistor | Qty. (pcs) |
| 4T0090 | 90 | BKU-4045 | 3 | 12.5kW 18Ω | 3 |
| 4T0110 | 110 | BKU-4045 | 3 | 12.5kW 16Ω | 3 |
| 4T0132 | 132 | BKU-4220 | 1 | 80kW 3.5Ω | 1 |
| 4T0160 | 160 | BKU-4220 | 1 | 80kW 3.2Ω | 1 |
| 4T0185 | 185 | BKU-4110 | 2 | 50kW 5Ω | 2 |
| 4T0200 | 200 | BKU-4110 | 2 | 50kW 5Ω | 2 |
| 4T0220 | 220 | BKU-4110 | 2 | 50kW 5Ω | 2 |
| 4T0250 | 250 | BKU-4220 | 2 | 60kW 4.7Ω | 2 |
| 4T0280 | 280 | BKU-4220 | 2 | 80kW 3.5Ω | 2 |
| 4T0315 | 315 | BKU-4220 | 2 | 80kW 3.5Ω | 2 |
| 4T0355 | 355 | BKU-4220 | 2 | 80kW 3.5Ω | 2 |

When braking time occupied within a braking period is 40%, configuration of the externally installed braking unit and braking resistor is shown as Table 2-4.

**Table 2-4 Configuration table for 400V braking unit and braking resistor**

| Inverter model AS450 | Inverter capacity (kW) | Braking unit | | Braking resistor (Utilization rate 40%) | |
|---|---|---|---|---|---|
| | | Specification | Qty. (pcs) | Specification of equivalent braking resistor | Qty. (pcs) |
| 4T01P1 | 1.1 | Built-in | | 800W 275Ω | 1 |
| 4T02P2 | 2.2 | | | 1.3kW 180Ω | 1 |
| 4T03P7 | 3.7 | | | 2.2kW 110Ω | 1 |
| 4T05P5 | 5.5 | | | 3.3kW 75Ω | 1 |
| 4T07P5 | 7.5 | | | 4.5kW 55Ω | 1 |
| 4T0011 | 11 | | | 6.6kW 37Ω | 1 |
| 4T0015 | 15 | | | 9kW 27Ω | 1 |
| 4T18P5 | 18.5 | | | 11kW 22Ω | 1 |
| 4T0022 | 22 | | | 13kW 18Ω | 1 |
| 4T0030 | 30 | BKU-4045 | 1 | 20kW 13.5Ω | 1 |
| 4T0037 | 37 | BKU-4030 | 2 | 12.5kW 22Ω | 2 |
| 4T0045 | 45 | BKU-4045 | 2 | 12.5kW 18Ω | 2 |
| 4T0055 | 55 | BKU-4045 | 2 | 20kW 15Ω | 2 |
| 4T0075 | 75 | BKU-4110 | 1 | 60kW 5Ω | 1 |
| 4T0090 | 90 | BKU-4110 | 1 | 60kW 5Ω | 1 |
| 4T0110 | 110 | BKU-4220 | 1 | 70kW 3.7Ω | 1 |
| 4T0132 | 132 | BKU-4220 | 1 | 70kW 3.7Ω | 1 |
| 4T0160 | 160 | BKU-4220 | 1 | 90kW 3Ω | 1 |

| Inverter model AS450 | Inverter capacity (kW) | Braking unit | | Braking resistor (Utilization rate 40%) | |
|---|---|---|---|---|---|
| | | Specification | Qty. (pcs) | Specification of equivalent braking resistor | Qty. (pcs) |
| 4T0185 | 185 | BKU-4220 | 2 | 60kW 5Ω | 2 |
| 4T0200 | 200 | BKU-4220 | 2 | 60kW 5Ω | 2 |
| 4T0220 | 220 | BKU-4220 | 2 | 70kW 3.7Ω | 2 |
| 4T0250 | 250 | BKU-4220 | 2 | 70kW 3.7Ω | 2 |
| 4T0280 | 280 | BKU-4220 | 2 | 90kW 3Ω | 2 |
| 4T0315 | 315 | BKU-4220 | 2 | 90kW 3Ω | 2 |
| 4T0355 | 355 | BKU-4220 | 2 | 90kW 3Ω | 2 |

# Chapter 3 Installation of the Inverter



## 3.1 Installation Steps

Step 1: delivery of the inverter

- Examine and confirm the catalog number on the label is the same as that on the order form
- Remove the packing of AS450 inverter and examine it for any damage during transportation

Step 2: examine the line voltage

- Examine and confirm that the line voltage is matched with voltage and frequency range of the inverter

Step 3: install the inverter

- Install the inverter as described in this document
- Install any internal and external option

Step 4: wiring of the inverter

- Connect the motor and ensure the voltage is consistent with the inverter
- Connect the control line
- Connect the speed reference
- Connect the communication cable
- Connect the encoder cable
- Connect the power line after power is turned off

## 3.2 Mechanical Installation

### 3.2.1 Installation Environment of the Product

3.2.1.1 Temperature and Humidity

Operating ambient temperature is -10℃ ~40℃. Derating when the ambient temperature exceeds 40℃(maximum 50℃). For the ambient temperature greater than 40℃, derating by 2% for every increase of 1℃. Relative humidity of the air is ≤95%, without condensation.

For the occasions with poor environment on site, it is recommended to enhance the cooling of the inverter.

3.2.1.2 Altitude

In altitude below 1000m area, the inverter can operating under rated power. Derating when the installation altitude over 1000m area (maximum 3000m). Fig. 3-1 shows the relationship between descendent rated output current and the altitude.

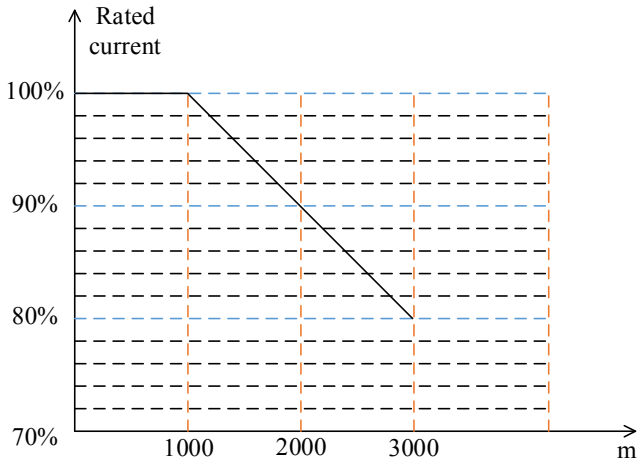



**Fig. 3-1 Diagram of rated output current vs. altitude**

3.2.1.3 Other Environmental Requirements

- Avoid installation in the places with violent vibration or shock, the maximum vibration acceleration not greater than 5.8m/s$^2$ (0.6g).
- Don't install it in the places with electromagnetic radiation point.
- Avoid installation in the places with oil mist, metal dust and more dust.
- Avoid installation in the places with poisonous and harmful gas, liquid, corrosive gas, flammable and explosive gas.
- Avoid installation in the places containing more salt content.
- Be sure not to install it in the place with direct sunshine.
- Be sure not to install it on the flammable object such as wood.
- Be sure not to drop any boring residue inside the inverter during installation.

## 3.2.2 Installation Position and Space Requirement

**Danger**

According to the installation method chosen, the inverter must be vertically installed:

-- inside the electrical cabinet

Horizontal installation in the electrical cabinet will be prohibited.

3.2.2.1 Installation Orientation

In order not to reduce the cooling effect of the inverter, it shall be installed in the place with good ventilation, with vertical installation direction.

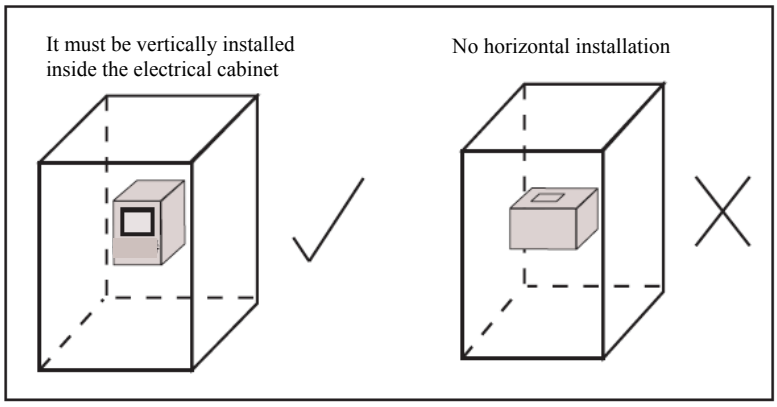



**Fig. 3-2 Installation orientation**

When the user vertically installs the inverter, the included angle between it and the horizontal plane will be 87° to 90°. The details are shown as Fig. 3-3:

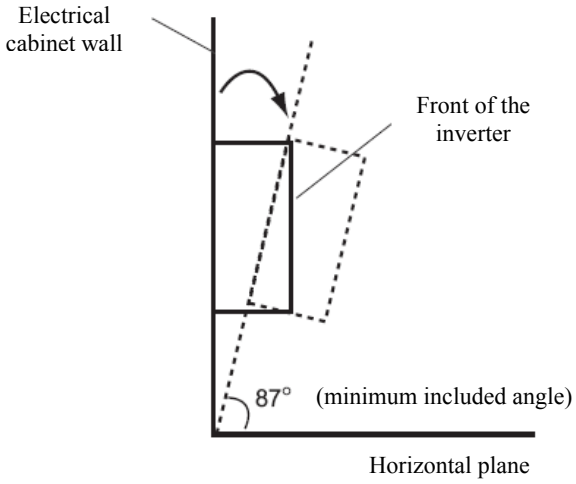



**Fig. 3-3 Permissible installation included angle**

3.2.2.2 Installation Space

Several inverters may be installed side by side or up and down, space among inverters as well as that between the inverter and the electrical cabinet wall shall be:

Refer to Fig. 3-4(a) for the installation space of the inverter 37kW and below.

Refer to Fig. 3-4(b) for the installation space of the inverter 45kW and above.

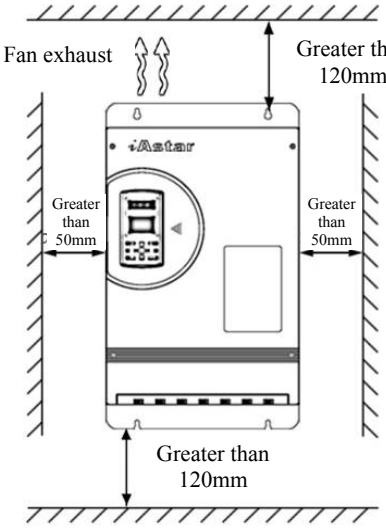



**Figure 3-4(a) Installation space schematic of the inverter (37kW and below)**

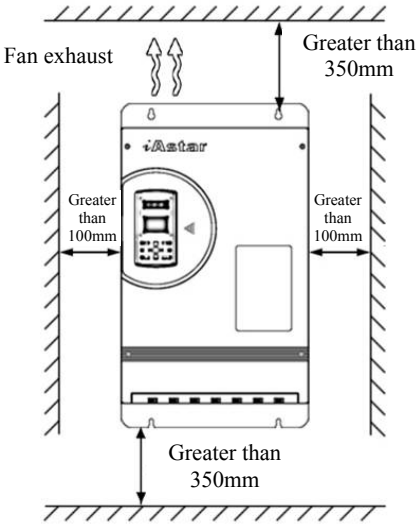



**Figure 3-4(b) Installation space schematic of the inverter (45kW and above)**

### 3.2.3 Inverter Installation

Refer to Fig. 3-5 for the installation procedures:

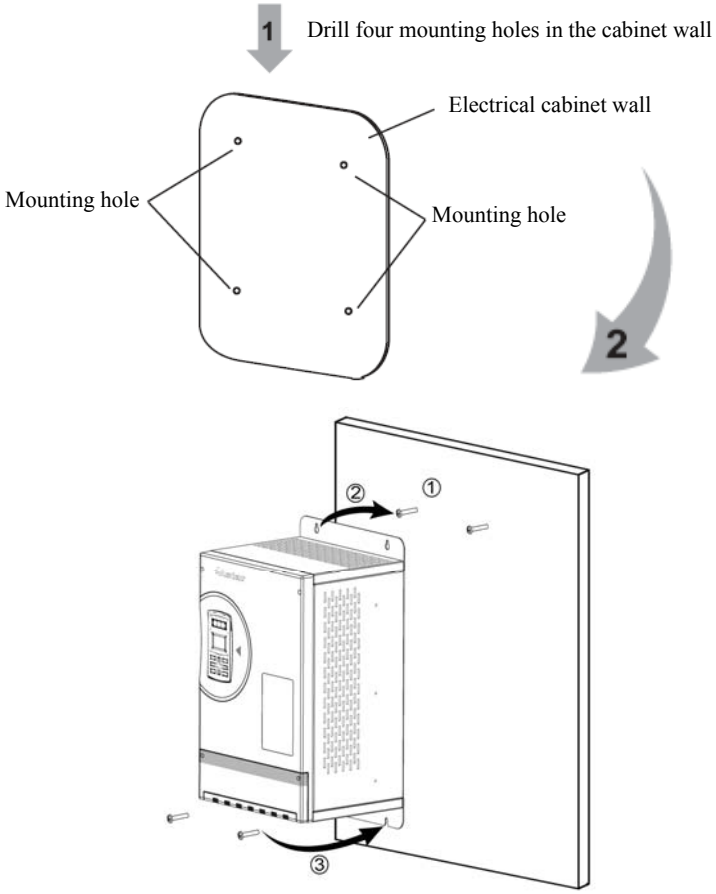



**Fig. 3-5 Installation procedures**

# ☞Important

Fasteners must have anti-vibration parts such as spring washer.

All four mounting screws must be securely tightened.



## 3.3 Installation and Disassembling of the Operator and Panel

### 3.3.1 Connect/Disconnect the Operator

3.3.1.1 Disconnect the Operator

① Press latch springs at both sides of operator simultaneously to unhook the operator from the front panel, and then the operator can be removed from inverter.

② A cable at the back of operator connecting to inverter needs to be unplugged. Note, do not pull directly on the cable, it may damage the connection.

Connect and disconnect operator, see Fig. 3-6


**Fig. 3-6 Disconnect operator**

3.3.1.2 Connect Operator

Plug the cable into the socket at the back of operator first, then slide one side of latch into the groove of front panel, press operator against the panel until a “Click” sound heard. Both latches are locked properly.

### 3.3.2 Open/Close Wiring Cap

3.3.2.1 Open Wiring Cap

① Loose two screws on wiring cap;

② Open wiring cap downward.

Open wiring cap, see Fig. 3-7.

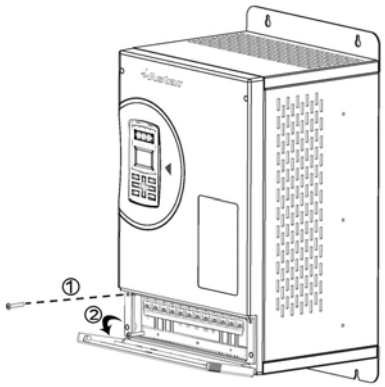



**Fig. 3-7 Open wiring cap**

3.3.2.2 Close Wiring Cap

Operate open wiring cap procedure reversely to close it, tighten two thumb screws.

### 3.3.3 Install and Disassemble Front Panel

Front panel needs to be dismounted when controlling loop is wired. For the convenience to wire the main loop the front panel may also be removed.

3.3.3.1 Disassemble Front Panel

Procedures of disassembling front panel:

② Remove operator. Refer to chapter 3.3.1 Connect/Disconnect the operator;

② Open wiring cap. Refer to chapter 3.3.2 Open/Close wiring cab;

③ Loose two screws at top of the front panel and two screws inside wiring cap compartment, and then the front panel can be removed.

The Operation to remove the front panel, see Fig. 3-8.

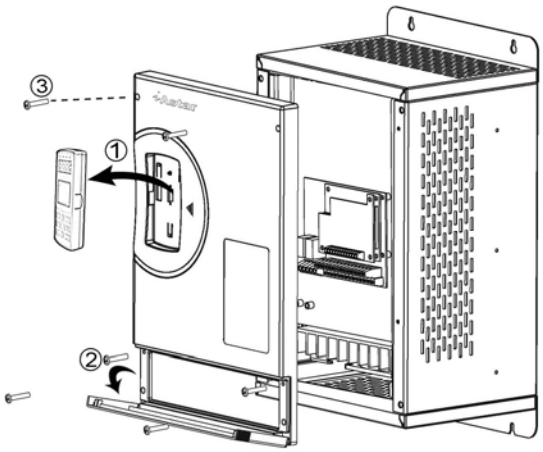



**Fig. 3-8 Disassemble front panel**

3.3.3.2 Install Front Panel

Install front panel in a reversed order of disassembling the front panel.

# Chapter 4 Wiring of the Inverter

This chapter introduces the wire connection in details in inverter and its peripheral equipment, inverter terminal blocks, main circuit looping, controlling circuit looping and PG card.



## Danger

◎ **Ensure to have power supply fully disconnected before wiring.**

Or it may cause electric shock.

◎ **Only the certified electrician can handle wiring task.**

Or it may cause electric shock.

◎ **Ensure the protect grounding terminal PE to be grounded reliably.**

Or it may cause electric shock.

◎ **Don't touch terminal block by hand directly, don't connect the output cable to the inverter encloser.**

Or it may cause electric shock.

◎ **Don't connect power supply to output terminal U, V, W.**

Or it may damage inverter.

◎ **Do not short connect the terminal ⊕1 /⊕2 to ⊖.**

Or it may have a risk of explosion hazard.

## Notice

◎ **Ensure the consistency between the voltage of power supply in AC main circuit and rated voltage.**

Or it may cause human injury and fire hazard.

◎ **Connect braking resistor correctly referring to wiring diagram.**

Or it may cause fire hazard.

◎ **Secure fastenedly connect the main circuit to the wiring cables or to the wire crimping terminal.**

Or it may damage inverter.

## 4.1 Connect Inverter to Peripherals

### 4.1.1 Connection Diagram between Inverter and Peripherals

Connection diagram between the inverter and its peripheral equipments. See Fig. 4-1.

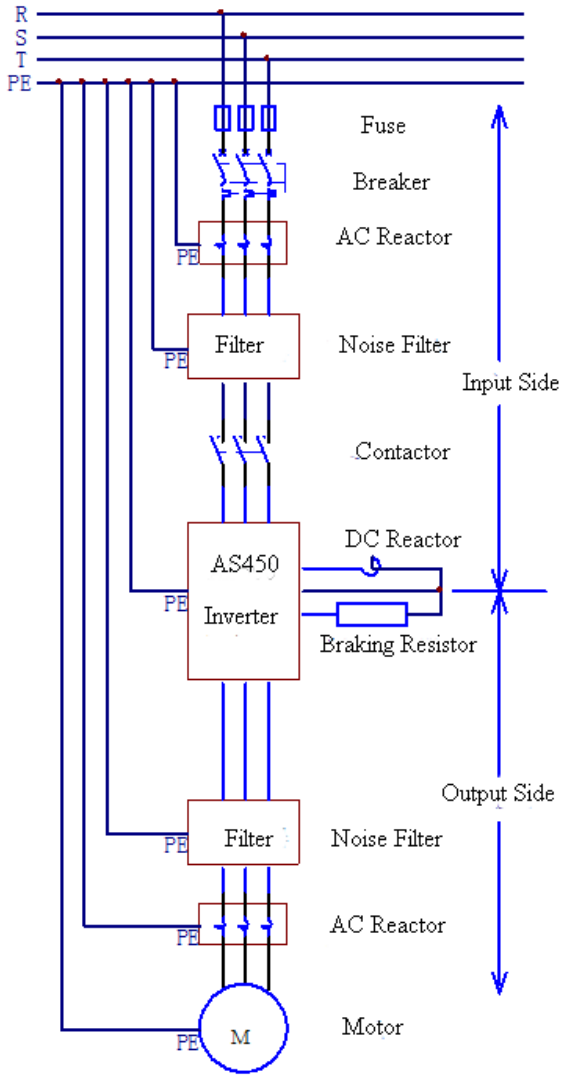



**Fig. 4-1 The connection between the inverter and its peripheral equipment**

Note: Sample drawing shows 3-phase input power supply.

### 4.1.2 Connect Inverter to Peripherals

4.1.2.1 Input Power Connection

**Danger** Don't operate inverter beyond the rated input voltage range.

Overvoltage may damage inverter permanently.

**Table 4-1 The technical requirements for the input power**

| The connection technical requirements for power input (Main circuit) | |
|---|---|
| Input Voltage | 380~460V AC 3 phase, -15%～+10% |
| Short Current (IEC60909 Standard) | If incoming cable is properly protected by fuse, the max permissible short current in 1 second is 100kA |
| Frequency | 45~65 Hz |
| Unbalance | Its maximum is ±3% of rated input line voltage. |
| Cable Temperature | It's permissible that the inverter works at 90℃ for a long-term period. |



4.1.2.2 Input Protection

Input protection includes breaker, fuse and emergency stop.

**Breaker**

Inverter doesn't carry breaker by itself. Therefore breaker must be installed between AC input power supply and the inverter. Ensure the following notice of the breaker:

- Type selection must conform with the applied safety regulation, including (but not limited to) national and local electric regulation.
- During installation and maintenance to the inverter, breaker must ensure to stay at open position and be locked.
- Breaker doesn't allow to control to start or stop the motor. Motor is controlled by operator keypad or I/O terminal command.
- Capacity of selected breaker should be 1.5~2 times of rated inverter current.
- Breaker time response character should correspond with the inverter overheat protection character (over 150% of rated output current for more than 1minute).

**Fuse cutout**

Terminal user must provide loop protection device, which is consistent with the national and local electric laws and regulations. The table 4-2 introduces recommended fuse cutout types, it provides short protection for inverter incoming cable.

**Table 4-2 The recommended fuse cutout types**

| Inverter Type AS450 | Input Current (A) | Main Fuse Cutout IEC269gG(A) | UL Grade T (A) | Type |
|---|---|---|---|---|
| 4T01P1 | 3.7 | 10 | 10 | CT10 |
| 4T02P2 | 6.6 | 10 | 10 | CT10 |
| 4T03P7 | 9.5 | 16 | 15 | CT16 |
| 4T05P5 | 13.7 | 20 | 20 | CT20 |
| 4T07P5 | 20 | 35 | 40 | FE40 |

| Inverter Type AS450 | Input Current (A) | Main Fuse Cutout IEC269gG(A) | UL Grade T (A) | Type |
|---|---|---|---|---|
| 4T0011 | 29 | 45 | 50 | FE45 |
| 4T0015 | 35 | 50 | 50 | FE50 |
| 4T18P5 | 43 | 70 | 70 | FE70 |
| 4T0022 | 50 | 70 | 70 | FE70 |
| 4T0030 | 66 | 100 | 100 | FE100 |
| 4T0037 | 82 | 100 | 100 | FE100 |
| 4T0045 | 106 | 160 | 160 | FEE160 |
| 4T0055 | 138 | 200 | 200 | FEE200 |
| 4T0075 | 170 | 400 | 400 | FWH-400A |
| 4T0090 | 205 | 400 | 400 | FWH-400A |
| 4T0110 | 250 | 400 | 400 | FWH-400A |
| 4T0132 | 280 | 700 | 700 | FWH-700A |
| 4T0160 | 312 | 800 | 800 | FWH-800A |
| 4T0185 | 380 | 800 | 800 | FWH-800A |
| 4T0200 | 400 | 1000 | 1000 | FWH-1000A |
| 4T0220 | 436 | 1000 | 1000 | FWH-1000A |
| 4T0250 | 490 | 1200 | 1200 | FWH-1200A |
| 4T0280 | 530 | 1200 | 1200 | FWH-1200A |
| 4T0315 | 610 | 1200 | 1200 | FWH-1200A |
| 4T0355 | 660 | 1200 | 1200 | FWH-1200A |

**Emergency stop**

General design and installation must include emergency stop device and other necessary safety equipment. To control motor by operator keypad operation, or I/O commend can't guarantee:

- Emergency motor stop;
- Separate inverter from hazardous voltage.

4.1.2.3 Input Power Cable/Connection

Input cable can be any one of followings:

- 4 core cable (3 phase and ground protection) without shield;
- 4 core insulated cable installed in conduit.

In any circumstances, the size of the conducting wire must smaller than the defined maximum limit value. When motor cable is too long or motor cable cross-section is too large, inverter should be derated and use cable based on the standard of cable cross-section (see Table 4-3). The larger the cross-section of the cable is, the bigger the capacity to the ground is, the lager the leak current to the ground is. When choose cable with lager cross-section, output current should be reduced. One level added of the cross-section of cable, 5% of the current reduced. Table 4-3 lists types of copper cables under different load currents. Recommended types are only suitable when the situation meets the top

part of the table. Aluminum cable is not recommended.

**Table 4-3 Relevant standards of IEC and NEC requirements for input power cables**

| IEC | NEC |
|---|---|
| Based on:<br>EN 60204-1 and IEC 60364-5-2/2001 standard;<br>PVC Insulation;<br>Ambient temperature at 30 °C;<br>Surface temperature at 70 °C;<br>Copper net shielded symmetrical cable;<br>No more than 9 cables laid side by side in a same cable tray compartment. | Based on:<br>For copper cable , see NEC Table 310-16;<br>Cable insulation at 90 °C;<br>Ambient temperature at 40 °C;<br>No more than 3 current-carrying cables in the same trunking, the cable trench, or the buried cables.<br>Copper net shielded copper core cable |

| Max Carry Current (A) | Copper cable ($mm^2$) | Max Carry Current (A) | Copper cable ($mm^2$) |
|---|---|---|---|
| 3.5 | 1 | 128 | 50 |
| 6.2 | 1.5 | 160 | 70 |
| 9 | 1.5 | 195 | 95 |
| 13 | 1.5 | 210 | 95 |
| 19 | 2.5 | 240 | 120 |
| 27 | 4 | 302 | 185 |
| 34 | 6 | 352 | 240 |
| 41 | 10 | 390 | 95×2P |
| 48 | 10 | 426 | 95×2P |
| 65 | 16 | 480 | 150×2P |
| 80 | 25 | 520 | 150×2P |
| 96 | 35 | 650 | 95×4P |

To ensure human safety, correct operation and to reduce electromagnetic radiation, inverter and motor must be grounded at their installed place.

- The diameter of conductor must meet the requirements of the safety laws and regulations.
- The shielding layer of power cable must be connected to PE terminal of inverter to meet the safety guideline.
- Only when the specifications of the power cable shielding layer meet safety requirements can the shielding layer of power cable be used as ground connection.
- Don’t connect terminal blocks in series when multi inverters installed.

4.1.2.4 Output Power Cable/Connection

**Table 4-4 Output power (Motor connection technical specification)**

| Technical specification for output power (motor) | |
|---|---|
| Output Voltage | 0 ~input voltage, symmetric 3-phase |
| Current | see Chapter 2, "2.2 Technical Indexes and Specifications of the Inverter" |
| Switch frequency | Allow to set: 1.1~8kHz |
| Rated cable temperature | Allow long term working at 90 °C |
| Length of motor cable vs. switch frequency | See Chapter 4, "4.4.5 Relationship between Length of Wire and Carrier Frequency" |

**Grounding and wiring**

Motor cable shielding: Motor cable requires to be shielded by wire conduit, armored cable or shielded cable. Armored cable or shielded cable: high frequency low impedance shielded cable should be adopted, such as braided copper wire mesh, aluminium wire mesh or wire mesh.

**Wire conduit**

- Each end point of wire conduit must install a grounded bridging.
- Wire conduit needs to be fixed on housing.
- Laying an individual conduit for motor cable only. (separate input power cable and control cable)
- One separated conduit for each inverter

**Armored cable**

- Each end point of wire conduit must install a grounded bridging;
- To use cable having 6 wires (3 power lines, 3 grounding lines). Type MC continuous corrugated Aluminum armored cable with symmetric grounding lines;
- Metal-clay motor cable can share one cable tray with input power cable. But it can't share with control cable.

**Shielded cable**

Recommend to use symmetric PE conductor cable certified by CE or C-Tick.

**Grounding**

Recommended cross-sectional area of grounded wire is in Table 4-13 of Chapter 4.3.4.1.

4.1.2.5 AC Reactor at the Input Side

In order to prevent the large current from flowing into the input power loop and damage the rectifying elements when the peak pulse is input from the grid, AC reactor will be connected at the

input side, which also is able to improve power factor of the input side and reduce the higher harmonic current. To effectively protect the inverter, it is recommended to add AC input reactor for 380V inverter 110kW and above (including 110kW).

Selection of AC reactor at the input side refers to Table 4-5.

**Table 4-5 The recommended types of input AC resistor**

| Inverter Type AS450 | Power (kW) | Recommended Type | Current (A) | Inductance (mH) | Voltage Drop |
|---|---|---|---|---|---|
| 4T01P1 | 1.1 | ACR-0005-2M80-0.4SC | 5 | 2.800 | 2% |
| 4T02P2 | 2.2 | ACR-0007-2M00-0.4SC | 7 | 2.000 | 2% |
| 4T03P7 | 3.7 | ACR-0010-1M40-0.4SC | 10 | 1.400 | 2% |
| 4T05P5 | 5.5 | ACR-0015-0M94-0.4SC | 15 | 0.940 | 2% |
| 4T07P5 | 7.5 | ACR-0020-0M70-0.4SC | 20 | 0.700 | 2% |
| 4T0011 | 11 | ACR-0030-0M47-0.4SC | 30 | 0.470 | 2% |
| 4T0015 | 15 | ACR-0040-0M36-0.4SC | 40 | 0.360 | 2% |
| 4T18P5 | 18.5 | ACR-0050-0M28-0.4SC | 50 | 0.280 | 2% |
| 4T0022 | 22 | ACR-0060-0M24-0.4SC | 60 | 0.240 | 2% |
| 4T0030 | 30 | ACR-0080-0M18-0.4SC | 80 | 0.180 | 2% |
| 4T0037 | 37 | ACR-0090-0M16-0.4SC | 90 | 0.156 | 2% |
| 4T0045 | 45 | ACR-0120-0M12-0.4SA | 120 | 0.117 | 2% |
| 4T0055 | 55 | ACR-0150-094U-0.4SA | 150 | 0.094 | 2% |
| 4T0075 | 75 | ACR-0200-070U-0.4SA | 200 | 0.070 | 2% |
| 4T0090 | 90 | ACR-0250-056U-0.4SA | 250 | 0.056 | 2% |
| 4T0110 | 110 | ACR-0250-056U-0.4SA | 250 | 0.056 | 2% |
| 4T0132 | 132 | ACR-0290-048U-0.4SA | 290 | 0.048 | 2% |
| 4T0160 | 160 | ACR-0330-042U-0.4SA | 330 | 0.042 | 2% |
| 4T0185 | 185 | ACR-0390-036U-0.4SA | 390 | 0.036 | 2% |
| 4T0200 | 200 | ACR-0490-028U-0.4SA | 490 | 0.028 | 2% |
| 4T0220 | 220 | ACR-0490-028U-0.4SA | 490 | 0.028 | 2% |
| 4T0250 | 250 | ACR-0600-024U-0.4SA | 600 | 0.024 | 2% |
| 4T0280 | 280 | ACR-0600-024U-0.4SA | 600 | 0.024 | 2% |
| 4T0315 | 315 | ACR-0660-022U-0.4SA | 660 | 0.022 | 2% |
| 4T0355 | 355 | ACR-0800-17U5-0.4SA | 800 | 0.0175 | 2% |

4.1.2.6 Interference Filter at the Input Side

When the inverter is working, other electronic equipment surrounded may be interfered by the power line. Filter is adopted to reduce the interference to the surrounding equipment.

Selection of the filter at the input side of 380V inverter refers to Table 4-6.

**Table 4-6 The recommended types of input filter**

| Inverter Type AS450 | Power (kW) | Recommended Type | Current (A) |
|---|---|---|---|
| 4T01P1 | 1.1 | RFI4C5 | 5 |
| 4T02P2 | 2.2 | RFI4C10 | 10 |
| 4T03P7 | 3.7 | RFI4C10 | 10 |
| 4T05P5 | 5.5 | RFI4C20 | 20 |
| 4T07P5 | 7.5 | RFI4C20 | 20 |
| 4T0011 | 11 | RFI4C36 | 36 |
| 4T0015 | 15 | RFI4C36 | 36 |
| 4T18P5 | 18.5 | RFI4C50 | 50 |
| 4T0022 | 22 | RFI4C50 | 50 |
| 4T0030 | 30 | RFI4C65 | 65 |
| 4T0037 | 37 | RFI4C80 | 80 |
| 4T0045 | 45 | RFI4C100 | 100 |
| 4T0055 | 55 | RFI4C150 | 150 |
| 4T0075 | 75 | RFI4C150 | 150 |
| 4T0090 | 90 | RFI4C200 | 200 |
| 4T0110 | 110 | RFI4C250 | 250 |
| 4T0132 | 132 | RFI4C250 | 250 |
| 4T0160 | 160 | RFI4C300 | 300 |
| 4T0185 | 185 | RFI4C400 | 300 |
| 4T0200 | 200 | RFI4C400 | 400 |
| 4T0220 | 220 | RFI4C600 | 600 |
| 4T0250 | 250 | RFI4C600 | 600 |
| 4T0280 | 280 | RFI4C600 | 600 |
| 4T0315 | 315 | RFI4C900 | 900 |
| 4T0355 | 355 | RFI4C900 | 900 |

Sample diagram for the correct setting of noise filter at power supply side, see Fig. 4-2.

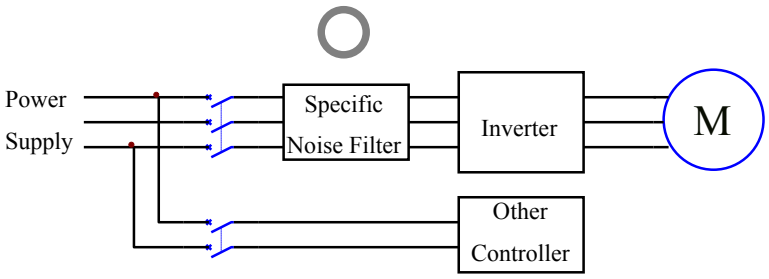



**Fig. 4-2 Correct noise filter installation at power supply side**

Sample diagram for the incorrect setting of noise filter at power supply side, see Fig. 4-3 and Fig. 4-4.

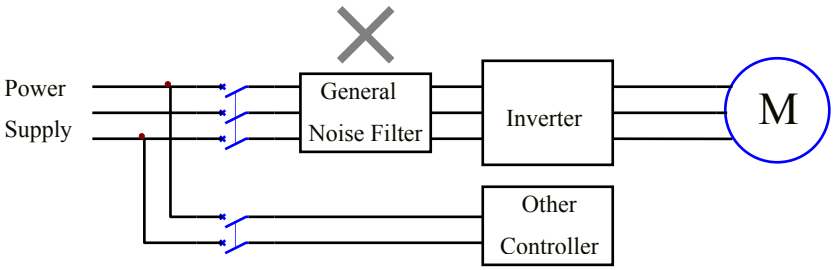



**Fig. 4-3 Incorrect noise filter installation at power supply side, example 1**

In Fig. 4-3, a general noise filter at power supply side may not meet the required expectation and should be avoided.

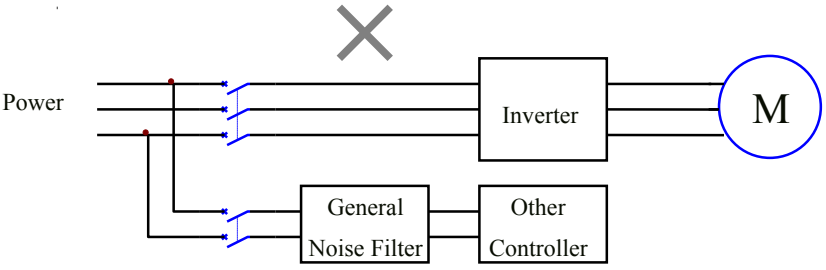



**Fig. 4-4 Incorrect noise filter installation at power supply side, example 2**

In Fig. 4-4, a general noise filter at receiving side may not meet the required expectation and should be avoided.

**Notice:** the wire length between filter and inverter should as short as possible when installing noise filter in the input side.

Filter housing and the installation of the cabinet should be large and reliable connections to reduce reflux of impedance noise current lg.

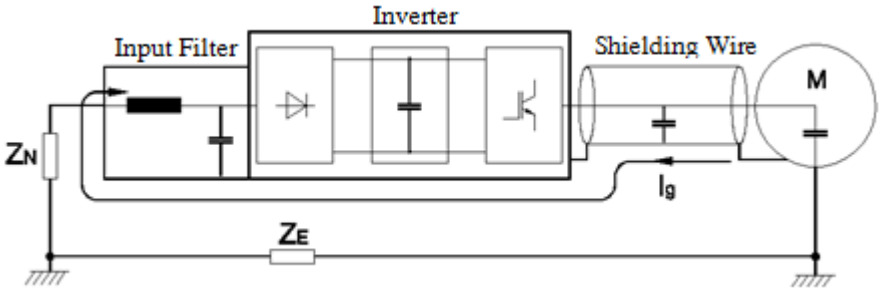



**Fig. 4-5 Noise current schematic diagram of noise filter**

4.1.2.7 Contactor at the Input/Output Side

In order to protect the power supply and avoid the fault being enlarged, input power of the inverter must be effectively cut off when the system has any fault. Electromagnetic contactor can be mounted at the input side to control power on and off of the main loop, to ensure safety.

Please don't use the contactor to control start and stop of the motor.

4.1.2.8 Interference Filter at the Output Side

Output noise filter may reduce the radio noise caused by the cable between inverter and motor as well as the leakage current of the conductor.

Selection of 380V output filter refers to Table 4-7.

**Table 4-7 Recommended selection table of output filter**

| Inverter Type AS450 | Power (kW) | Recommended Type | Current (A) |
|---|---|---|---|
| 4T01P1 | 1.1 | RFO4B5 | 5 |
| 4T02P2 | 2.2 | RFO4B10 | 10 |
| 4T03P7 | 3.7 | RFO4B10 | 10 |
| 4T05P5 | 5.5 | RFO4B20 | 20 |
| 4T07P5 | 7.5 | RFO4B20 | 20 |
| 4T0011 | 11 | RFO4B36 | 36 |
| 4T0015 | 15 | RFO4B36 | 36 |
| 4T18P5 | 18.5 | RFO4B50 | 50 |
| 4T0022 | 22 | RFO4B50 | 50 |
| 4T0030 | 30 | RFO4B65 | 65 |
| 4T0037 | 37 | RFO4B80 | 80 |
| 4T0045 | 45 | RFO4B100 | 100 |
| 4T0055 | 55 | RFO4B150 | 150 |
| 4T0075 | 75 | RFO4B150 | 150 |
| 4T0090 | 90 | RFO4B200 | 200 |
| 4T0110 | 110 | RFO4B250 | 250 |
| 4T0132 | 132 | RFO4B250 | 300 |
| 4T0160 | 160 | RFO4B300 | 300 |
| 4T0185 | 185 | RFO4B400 | 400 |
| 4T0200 | 200 | RFO4B400 | 400 |
| 4T0220 | 220 | RFO4B600 | 600 |
| 4T0250 | 250 | RFO4B600 | 600 |
| 4T0280 | 280 | RFO4B600 | 600 |
| 4T0315 | 315 | RFO4B900 | 900 |
| 4T0355 | 355 | RFO4B900 | 900 |

4.1.2.9 AC Reactor at the Output Side

AC reactor at the output side can be chosen to control the radio frequency interference from the inverter.

When the wire between the inverter and the motor is too long (>100m) or there are several motors are running, because leakage current produced by the long cable-ground stray capacitance effect is too large, the inverter is easily subject to overcurrent protection, at the same time, output reactor

compensation must be increased to avoid motor insulation damage.

Selection of AC reactor refers to Table 4-8.

**Table 4-8 Recommended selection table of AC Reactor at the output side**

| Inverter Type AS450 | Power (kW) | Recommended Type | Current (A) | Inductance (mH) | Voltage Droop |
|---|---|---|---|---|---|
| 4T01P1 | 1.1 | OCR-0005-1M40-0.4SC | 5 | 1.400 | 1% |
| 4T02P2 | 2.2 | OCR-0007-1M00-0.4SC | 7 | 1.000 | 1% |
| 4T03P7 | 3.7 | OCR-0010-0M70-0.4SC | 10 | 0.700 | 1% |
| 4T05P5 | 5.5 | OCR-0015-0M47-0.4SC | 15 | 0.470 | 1% |
| 4T07P5 | 7.5 | OCR-0020-0M35-0.4SC | 20 | 0.350 | 1% |
| 4T0011 | 11 | OCR-0030-0M23-0.4SC | 30 | 0.230 | 1% |
| 4T0015 | 15 | OCR-0040-0M18-0.4SC | 40 | 0.180 | 1% |
| 4T18P5 | 18.5 | OCR-0050-0M14-0.4SC | 50 | 0.140 | 1% |
| 4T0022 | 22 | OCR-0060-0M12-0.4SC | 60 | 0.120 | 1% |
| 4T0030 | 30 | OCR-0080-087U-0.4SC | 80 | 0.087 | 1% |
| 4T0037 | 37 | OCR-0090-078U-0.4SC | 90 | 0.078 | 1% |
| 4T0045 | 45 | OCR-0120-058U-0.4SA | 120 | 0.058 | 1% |
| 4T0055 | 55 | OCR-0150-047U-0.4SA | 150 | 0.047 | 1% |
| 4T0075 | 75 | OCR-0200-035U-0.4SA | 200 | 0.035 | 1% |
| 4T0090 | 90 | OCR-0250-028U-0.4SA | 250A | 0.028 | 1% |
| 4T0110 | 110 | OCR-0250-028U-0.4SA | 250A | 0.028 | 1% |
| 4T0132 | 132 | OCR-0290-024U-0.4SA | 290 | 0.024 | 1% |
| 4T0160 | 160 | OCR-0330-021U-0.4SA | 330 | 0.021 | 1% |
| 4T0185 | 185 | OCR-0390-018U-0.4SA | 390 | 0.018 | 1% |
| 4T0200 | 200 | OCR-0490-014U-0.4SA | 490 | 0.014 | 1% |
| 4T0220 | 220 | OCR-0490-014U-0.4SA | 490 | 0.014 | 1% |
| 4T0250 | 250 | OCR-0600-012U-0.4SA | 600 | 0.012 | 1% |
| 4T0280 | 280 | OCR-0600-012U-0.4SA | 600 | 0.012 | 1% |
| 4T0315 | 315 | OCR-0660-011U-0.4SA | 660 | 0.011 | 1% |
| 4T0355 | 355 | OCR-0800-08U7-0.4SA | 800 | 0.0087 | 1% |

4.1.2.10 DC Reactor

AS450 series inverter ≥30kW (400V grade) is provided with built-in DC reactor, which is able to improve the power factor, avoid too large input current of the inverter due to the large capacity transformer connected, leading to damage of the rectifier bridge, as well as avoid the damage caused by harmonic due to voltage leap of the grid or phase control load to the rectifying circuit.

AS450 series inverter below 30kW (400V grade) is provided with externally installed DC reactor. Refer to Table 4-9 for its selection.

**Table 4-9 Recommended selection table of DC reactor**

| Inverter Type AS450 | Power (kW) | Recommended Type | Current (A) | Inductance (mH) |
|---|---|---|---|---|
| 4T01P1 | 1.1 | DCR-0010-6M30-0.4DC | 10 | 6.3 |
| 4T02P2 | 2.2 | DCR-0010-6M30-0.4DC | 10 | 6.3 |
| 4T03P7 | 3.7 | DCR-0010-6M30-0.4DC | 10 | 6.3 |
| 4T05P5 | 5.5 | DCR-0015-3M60-0.4DC | 15 | 3.6 |
| 4T07P5 | 7.5 | DCR-0020-3M60-0.4DC | 20 | 3.6 |
| 4T0011 | 11 | DCR-0030-2M00-0.4DA | 30 | 2 |
| 4T0015 | 15 | DCR-0040-2M00-0.4DA | 40 | 2 |
| 4T18P5 | 18.5 | DCR-0040-1M30-0.4DA | 40 | 1.3 |
| 4T0022 | 22 | DCR-0050-1M08-0.4DA | 50 | 1.08 |

## 4.2 Wiring of Inverter Terminals

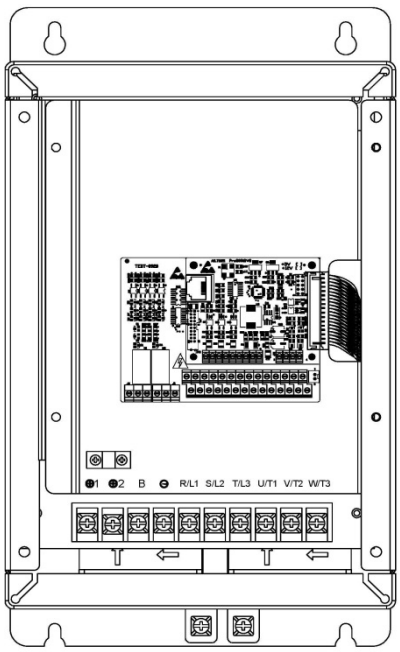



**Fig. 4-6 Internal view of the inverter**

**Note:** terminals of the inverter with different power level are the same in terms of position and arrangement except for those power input/output terminals. We take 11kW inverter as an example in the figure.

### 4.2.1 Wiring Diagram of the Inverter Terminals

Basic wiring diagram of the inverter with no built-in DC reactor and built-in braking unit is shown as Fig.4-7.

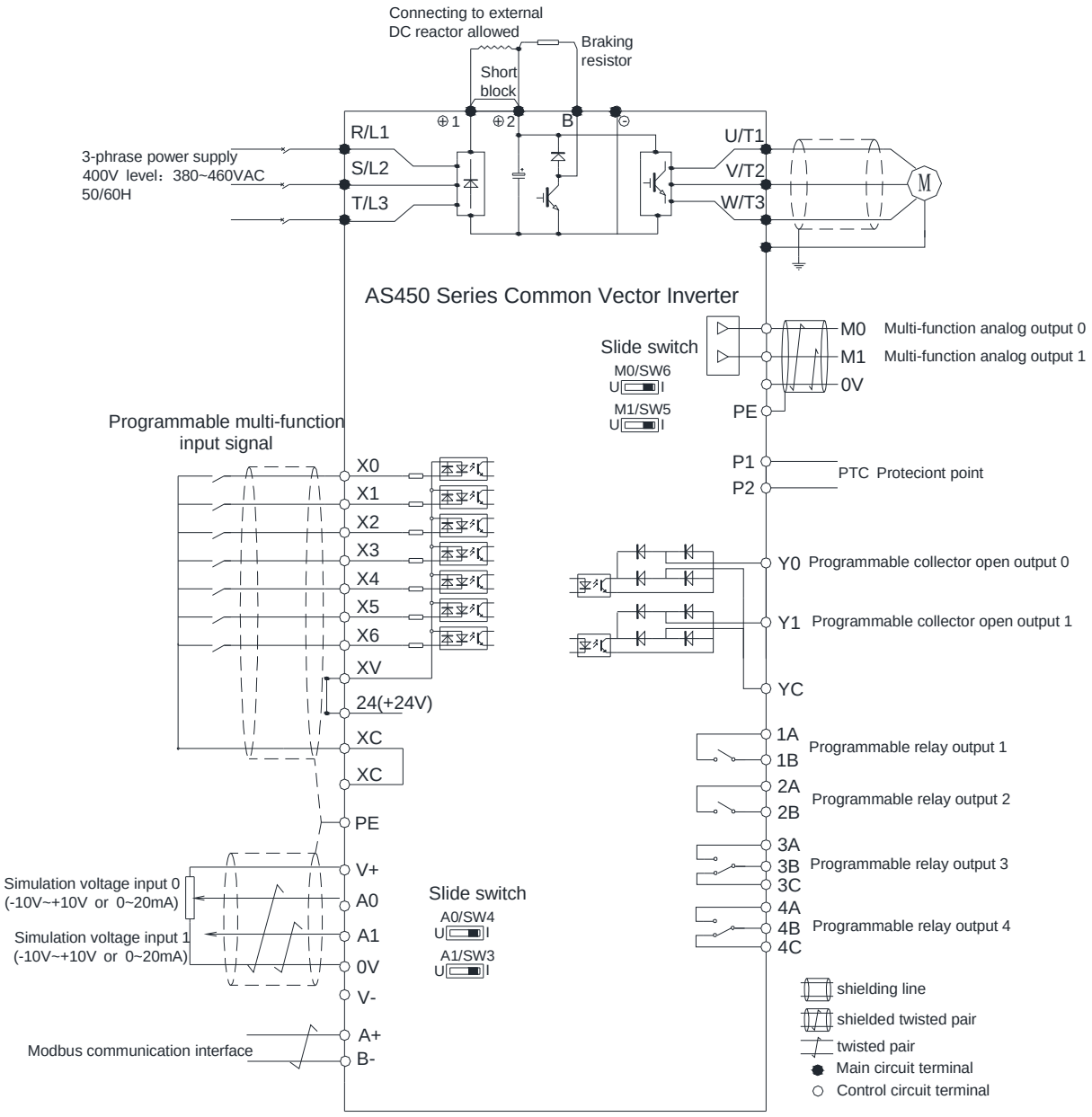



**Fig. 4-7 Wiring schematic of high performance vector inverter terminals (22kW and below)**

**Note:** input power in the diagram is given taking 3-phase power input as an example, 3-phase 380-600V power input for 400V grade inverter.

Basic wiring diagram of the inverter with built-in DC reactor and no built-in braking unit is shown as Fig. 4-8.

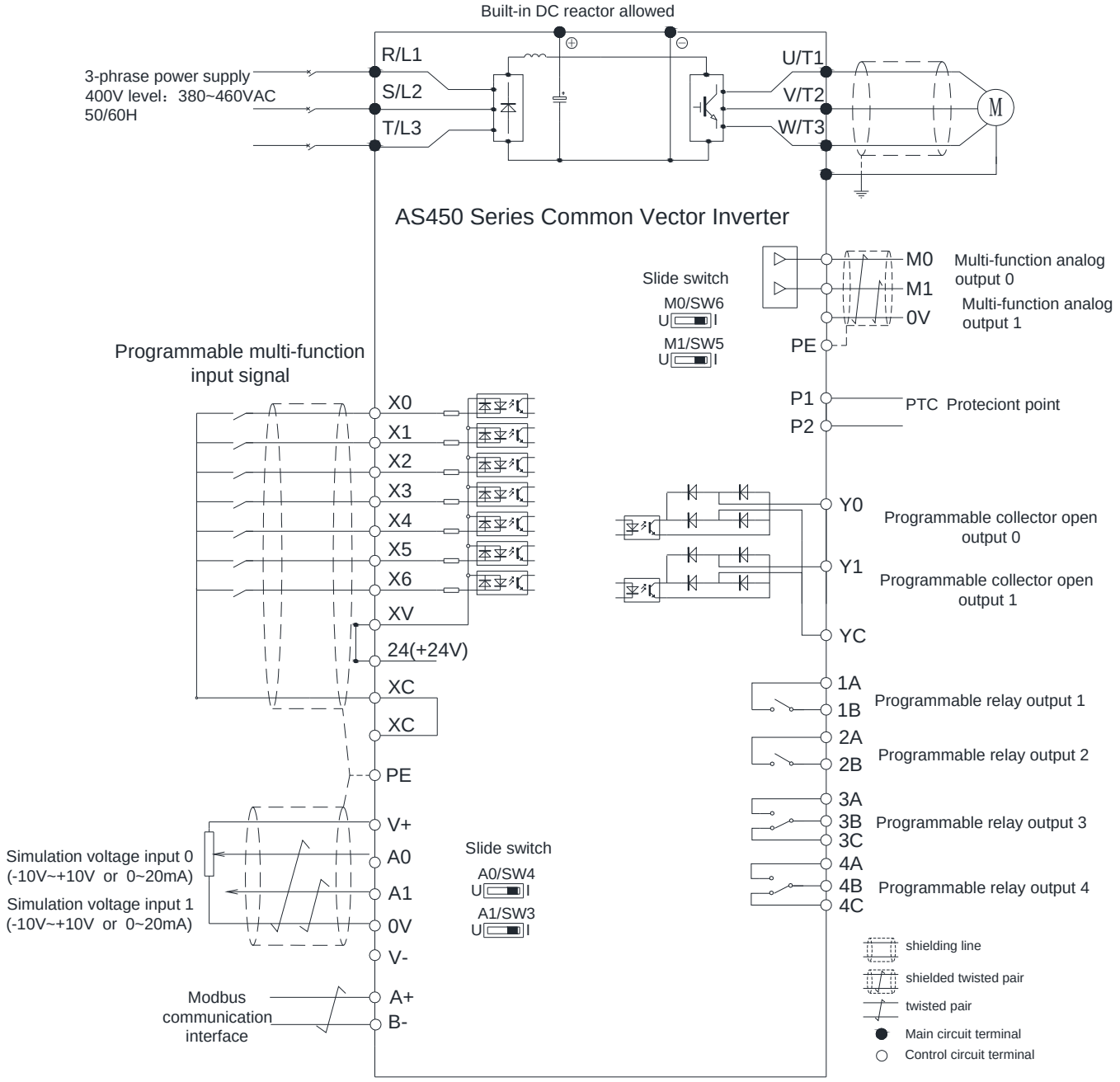



**Fig. 4-8 Wiring schematic 2 of inverter terminals (22kW and above)**

**Notes:**

1．Optional analog voltage and current signals can be input to A0/A1 simultaneously.

2．This inverter isn't provided with braking unit, but with the terminals for external connection.

### 4.2.2 Terminal wiring precaution

# ☞Important

a) Wiring should meet standard of electrician regulation.

b) Ensure wiring is correctly and reliably after finish of wire connection. Need to check-up:

- ◆ Is wiring correct?
- ◆ Is any loose piece, like wire clipping, screw left in the inverter?
- ◆ Any loosing screw?
- ◆ Does the stripped wire of the terminal parts contact to any other terminal?

c) AS450 series inverter equips (22kW and below) inside braking component. But it needs to connect external braking resistor. Braking resistor should be installed between terminal B and ⊕2. Please don't install them anywhere else, or it may damage braking resistor and inverter. AS450 series inverter equips (greater than 22kW) outside braking component.

d) AS450 series inverter equips (22kW and below) Select DC reactor is installed between terminal ⊕1 and ⊕2, and short block between those terminals needs to be taken off. AS450 series inverter equips (greater than 22kW) inside DC reactor.

e) For AS450 series inverter equips (22kW and below), if bus low voltage running function is needed, the emergency 220V power supply needs to be connected at terminals R0 and T0 on extended power board. A 48V DC power supply need to be connected between terminal R and S at the same time. No extra connection needs if there is no bus low voltage running function.

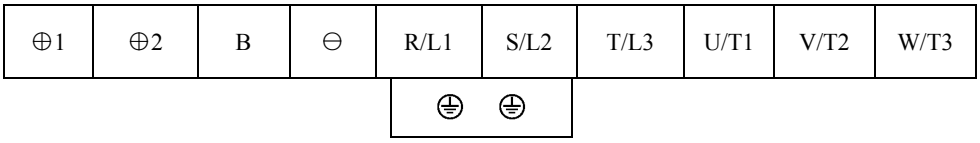
f) Inverter grounding point PE is recommended to ground to specialized grounding spot. The grounding resistance should be below 10Ω.

g) Keep the grounding cable as short as possible.

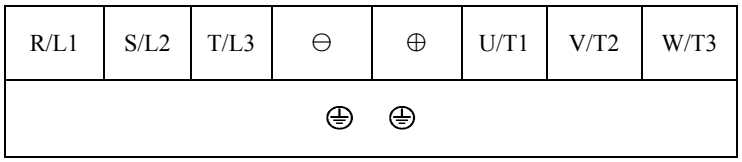
h) If there is any wire alteration required after power on, disconnect the power supply first. The capacity in main circuit needs a certain time to discharge. To avoid any hazard, charging indicator must be off, and then the DC voltage on charging capacity should be measured by DC voltmeter and is below a safety voltage of 24V before any further work.

## 4.3 Main Circuit Terminal Wiring

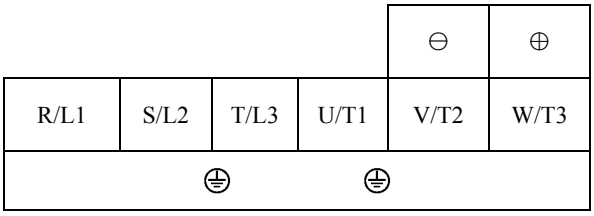
### 4.3.1 Line-up of Main Circuit Terminals




**a) 22kW and below**




**b) 30kW~55kW**




**c) 75kW~355kW**

**Fig. 4-9 The line-up of connection terminals of the main circuit**

## .3.2 Main Circuit Terminal Label and Function Specification

Function specification for main circuit terminals, see Table 4-10.

**Table 4-10 Function specification of main circuit terminals**

| Terminal Label | Function Specification |
|---|---|
| ⊕1 | May connect external DC reactor. Short connected by factory default |
| ⊕2 | |
| ⊕2 | Connect to external braking resistor |
| B | |
| ⊕2/⊕ | DC Bus cable positive/negative output terminal. May connect external DC reactor or common DC bus. |
| ⊖ | |
| R/L1 | Main circuit input AC power supply, connecting 3 phase input |
| S/L2 | |
| T/L3 | |
| U/T1 | Inverter output, connecting 3 phase async motor |
| V/T2 | |
| W/T3 | |
| ⏚ | Ground terminal, connect the protective ground, when the 400V class ground resistance is not greater than 4Ω |

## 4.3.3 Main Circuit Wire Specification

600V insulated copper conductor power supply cable is used. Specification of wire and tightening torque, see Table 4-11.

**Table 4-11 Wire Specification and Tightening Torque**

| Model-AS450 | Connectable wire specification（$mm^2$） | Recommended wire specification（$mm^2$） | Tightening Torque （N.m） |
|---|---|---|---|
| 4T01P1 | 1.5～2.5 | 2.5 | 2.7 |
| 4T02P2 | 1.5～2.5 | 2.5 | 2.7 |
| 4T03P7 | 2.5～4 | 4 | 2.7 |
| 4T05P5 | 4～8 | 6 | 2.7 |
| 4T07P5 | 4～8 | 6 | 2.7 |
| 4T0011 | 4～8 | 6 | 2.7 |
| 4T0015 | 8～16 | 16 | 3 |
| 4T18P5 | 8～16 | 16 | 3 |
| 4T0022 | 25～35 | 25 | 3 |
| 4T0030 | 35～50 | 35 | 6 |
| 4T0037 | 50～70 | 50 | 6 |
| 4T0045 | 70～95 | 70 | 6 |
| 4T0055 | 95 | 95 | 6 |
| 4T0075 | 85～115 | 95 | 10 |
| 4T0090 | 85～115 | 95 | 10 |
| 4T00110 | 95～135 | 120 | 10 |
| 4T0132 | 165～205 | 185 | 10 |
| 4T0160 | 205～265 | 240 | 10 |
| 4T0185 | 85～115(×2P) | 95×2P | 10 |
| 4T0200 | 85～115(×2P) | 95×2P | 10 |
| 4T0220 | 125～175(×2P) | 150×2P | 10 |
| 4T0250 | 125～175(×2P) | 150×2P | 10 |
| 4T0280 | 125～175(×2P) | 150×2P | 17 |
| 4T0315 | 85～115(×4P) | 95×4P | 17 |
| 4T0355 | 85～115(×4P) | 95×4P | 17 |

**Important**

The wire specifications are determined under the ambient temperature of 50℃, and the wire allowable temperature of 75℃.

Inverter main circuit uses open terminal block. Round crimp terminal should be used for open terminal block. To select round crimp terminal, see Table 4-12.

**Table 4-12 Round crimp terminal**

| Cross Section Area（$mm^2$） | Terminal Screw | Round crimp terminal |
|---|---|---|
| 0.5 | M3.5 | 1.25/3.5 |
| | M4 | 1.25/4 |
| 0.75 | M3.5 | 1.25/3.5 |
| | M4 | 1.25/4 |

| Cross Section Area（$mm^2$） | Terminal Screw | Round crimp terminal |
|---|---|---|
| 1.25 | M3.5 | 1.25/3.5 |
| | M4 | 1.25/4 |
| 2 | M3.5 | 2/3.5 |
| | M4 | 2/4 |
| | M5 | 2/5 |
| | M6 | 2/6 |
| | M8 | 2/8 |
| 3.5/5.5 | M4 | 5.5/4 |
| | M5 | 5.5/5 |
| | M6 | 5.5/6 |
| | M8 | 5.5/8 |
| 8 | M5 | 8/5 |
| | M6 | 8/6 |
| | M8 | 8/8 |
| 14 | M6 | 14/6 |
| | M8 | 14/8 |
| 22 | M6 | 22/6 |
| | M8 | 22/8 |
| 30/38 | M8 | 38/8 |
| 50/60 | M8 | 60/8 |
| | M10 | 60/10 |
| 80 | M10 | 80/10 |
| 100 | M10 | 100/10 |
| 120 | M12 | 120/12 |
| 185 | M12 | 185/12 |
| 240 | M12 | 240/12 |
| 300 | M12 | 300/12 |
| 380 | M12 | 380/12 |

**☞ Important**

Voltage drop of wire should be fully considered while selecting the wire cross section.

Typically maintains voltage within 2% of rated voltage, the cross section of wire needs to be increased if voltage drop is too heavy. Formula for calculating of voltage drop is:

Line to line voltage drop（V）= $\sqrt{3}$ * Line resistance（Ω）* Current （A）

### 4.3.4 Detailed Wiring Description for Terminals of the Main Loop

4.3.4.1 Power Supply

The inverter must be connected to the protected ground. Considering the high leakage current (exceeding 3.5mA), protective grounding must be taken for the purpose of observing the related current regulations.

4.3.4.2 Grounding Terminal (PE)

- Grounding terminal is recommended to ground to designated grounding spot, must be grounded reliably. The grounding resistance should be below 10Ω;
- Don't share grounding cable with welding machine, or other power devices;
- Grounding cable should comply with the technical standard for electric equipment, and should be as short as possible. The current leakage will cause instability of voltage potential at grounding terminal if the distance between grounding cable and grounding spot is too far;
- Recommend to use specific green-yellow ground cable; see Table. 4-13.

**Table 4-13 The cross section of grounding conductor**

| Installation：the cross section of conductor S($mm^2$) | Minimum cross section of grounding conductor Smin（$mm^2$） |
|---|---|
| S≤16 | S |
| 16＜S≤35 | 16 |
| 35＜S | S/2 |

- When multi-inverter are grounded, try to avoid looping the connection. Methods of multi-inverter grounding connection, see Fig. 4-10.

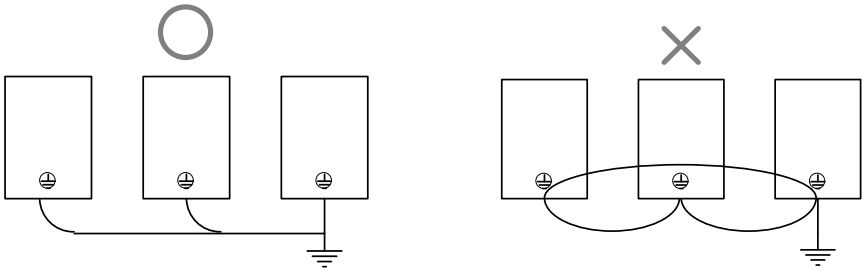


**Fig. 4-10 Methods of multi-inverter grounding connection**

**Notice**

Incorrect wiring:

If voltage of the input line is applied on (U/T1, V/T2, W/T3), the inverter will be damaged.

Examine power connection before the inverter is powered on.

If it needs to replace another inverter, please confirm that all wiring to the inverter conforms to the wiring instruction in this manual.

Nonobservance of the instruction manual will lead to death or serious injury.

4.3.4.3 DC +48V Power Supply Terminal（⊕2, ⊖）

- In case of power failure, storage battery may input +48V DC power supply to inverter via

terminal （⊕**2** ⊖）. It can operate the motor at a low speed and protect the machine from shock.

4.3.4.4 Power Supply Input terminals for Main Circuit (R/L1, S/L2, T/L3)

- Three phase AC power supply cable connects the main circuit terminals R/L1, S/L2, T/L3 via the breaker. The phase sequence of input power doesn't relate to the order of terminals R/L1, S/L2, T/L3. Any terminal can be connected.
- A noise filter can be installed at the power supply side in order to reduce transmission and radiation interference created by inverter. The noise filter can reduce the electromagnetic noise intruded from the power wire. It can also reduce the electromagnetic noise sent from inverter to power cable.

**Notice** **Please use the specialized noise filter for inverter only.**

4.3.4.5 External DC Reactor Terminals (⊕**1**, ⊕**2**)

- External DC reactor can be added to improve the power factor of inverter. Terminal ⊕**1**, ⊕**2** is short connected by short block by the factory pre-setting. To connect DC reactor, short block needs to be removed first, then proceeds the connection.
- Do not take off the short block if no DC reactor is used, or inverter may work abnormally.

Connecting short block, see Fig. 4-11.

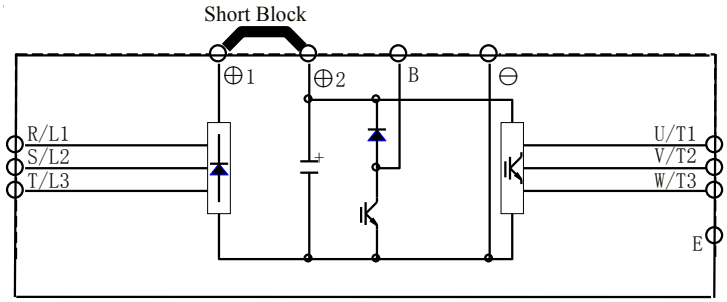



**Fig. 4-11 Connection diagram for short block**

Connecting external DC reactor, see Fig. 4-12.

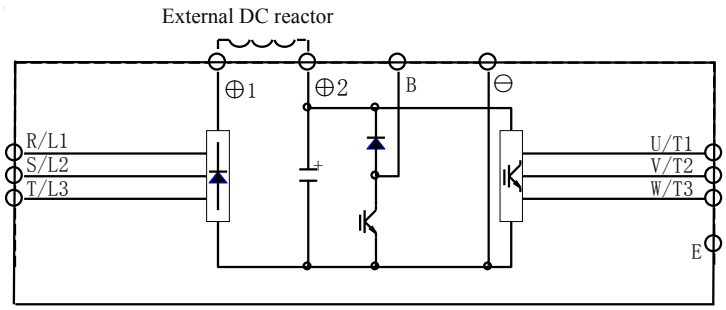



**Fig. 4-12 Connection diagram for external DC reactor**

4.3.4.6 External Braking Resistor Terminal（⊕2，B）

- AS450 inverter (≤22kW) is installed a built-in braking unit. External braking resistor is necessary to absorb released energy by motor braking. Table 2-2 400V Inverter Braking Resistor lists the specification of braking resistor.
- Braking resistor is installed between terminal ⊕2 and B.
- In order to maintain the breaking resistor working, the heat dissipation characteristic of braking resistor should be fully considered, and it should be well ventilated.
- The cable length of braking resistor connection can't be longer than 5m.

External braking resistor connection, see Fig. 4-13.

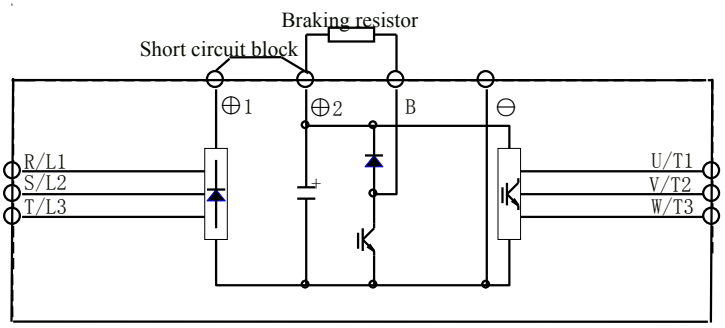



**Fig. 4-13 Connection diagram for external braking resistor**

4.3.4.7 Terminals of the External Braking Unit(⊕，⊖)

- When an outer braking unit is required, its ⊕ and ⊖ will be corresponding to (⊕，⊖) of the inverter one to one, with braking resistor being connected at its terminals BR1 and BR2.
- Length of the wire between (⊕，⊖) of the inverter and (⊕，⊖) of the braking unit shall be less than 5m, while that of the wiring for BR1 & BR2 of the braking unit and the braking resistor shall be less than 10m.

**Notice** Polarity of ⊕ and ⊖ won't be reversed, without braking resistor directly connected, otherwise it may cause inverter damage or fire.

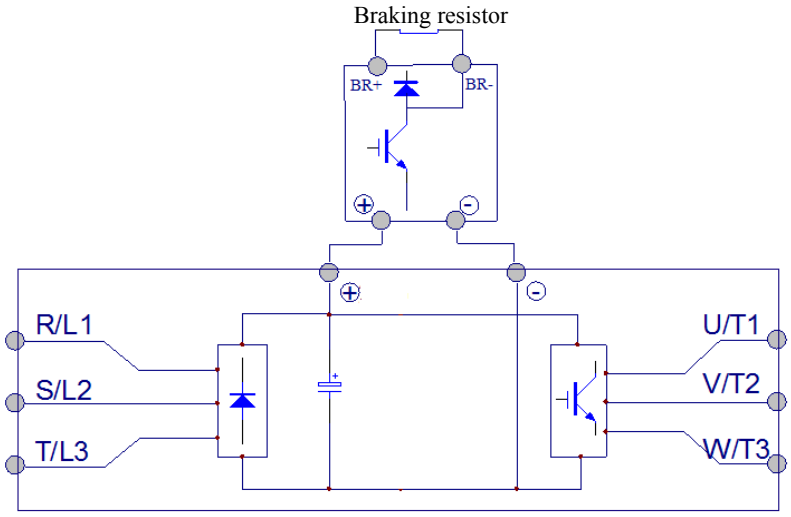



**Fig. 4-14 Diagram of outer braking unit**

4.3.4.8 Connection of Energy Feedback Unit

Our RG series energy feedback unit is able to feedback the electric power generated by the generator under regenerative braking to the grid. RG series energy feedback adopts IGBT as rectified feedback, comparing to the traditional 3-phase antiparallel bridge rectifier unit, its harmonic distortional component is less than 5% fundamental wave, with small pollution to the grid.

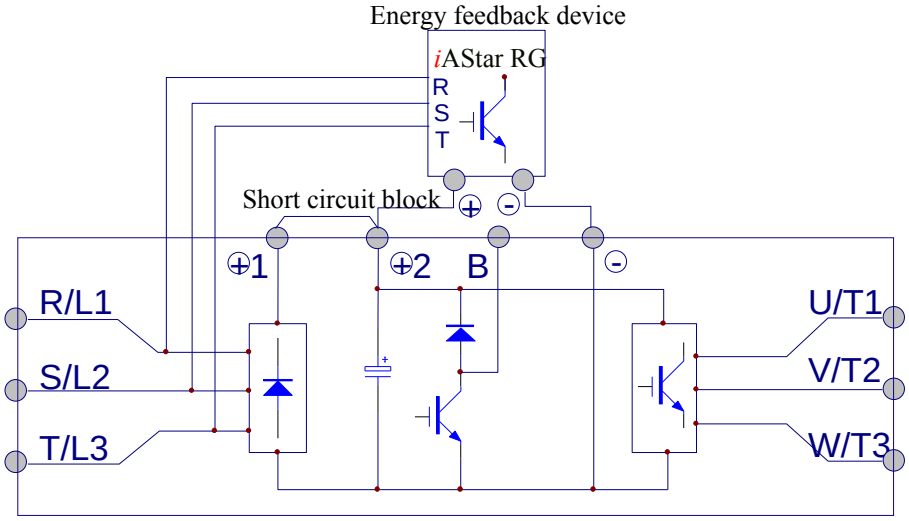



**Fig. 4-15 Diagram of outer energy feedback device**

4.3.4.9 Inverter Output Terminal (U/T1, V/T2, W/T3)

- Inverter output terminal U/T1, V/T2, W/T3 connects motor terminal U, V, W. If motor runs in wrong direction, please switch any two wires at inverter output or motor terminals.
- Never connect power supply input to inverter output U/T1, V/T2, W/T3 directly.
- Never ground, short the output terminals;
- Never install capacitors/surge filter at inverter output side, or it may cause the inverter overheat, or damage due to the output of higher harmonics.

- Never connect capacitor at inverter output side, see Fig. 4-16.

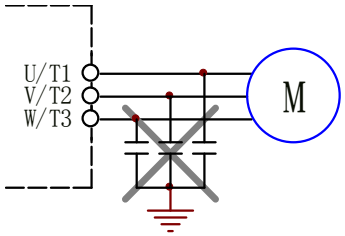



**Fig. 4-16 Never connect capacitor at inverter output side**

## 4.4 Anti-interference Measures

### 4.4.1 Connect Specific Noise Filter at Output

In order to restrain noise at inverter output side, a specific noise filter can be installed. To install a filter at output side, see Fig. 4.17.

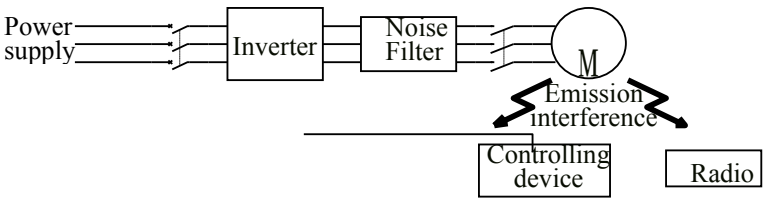



**Fig. 4-17 Connection diagram for noise filter at output side**

### 4.4.2 Surge Suppressor at Output Side

When the inverter connects to an inductive load equipment (electromagnetic contactor, relay and solenoid valve etc), please be sure to apply a surge suppressor on its coil, shown as Fig. 4-18.

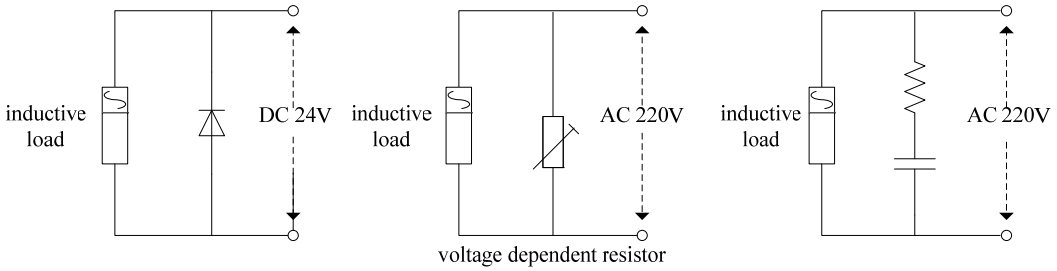



**Fig. 4-18 Application of surge suppressor in the inductive load**

### 4.4.3 Wiring Arrangement of the Main Loop

In order to control the radiated interference from output side of the inverter and enhance the anti-interference performance, enough distance shall be guaranteed between them and as far as possible, especially when the cable is laid in parallel or extended for a long distance. When the signal cable must pass through the power cable, then it will vertically pass through it. Wiring arrangement schematic of the main loop is shown as Fig. 4-19 and Fig. 4-20.

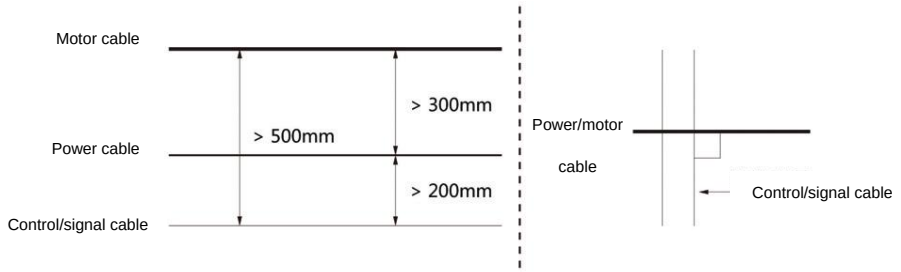



**Fig. 4-19 Wiring arrangement 1 of the main loop**

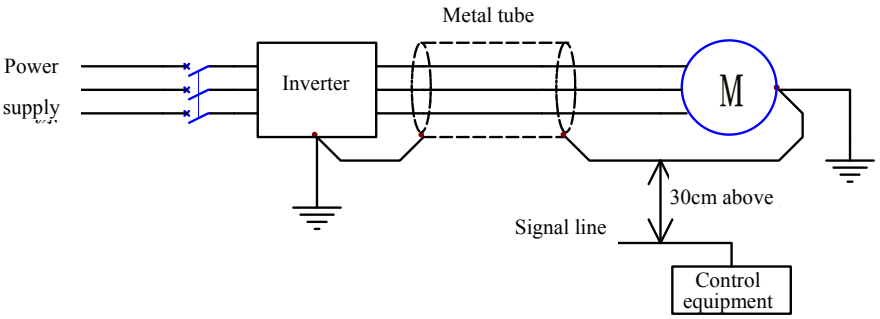



**Fig. 4-20 Wiring arrangement 2 of the main loop**

Generally, control cable must be shielded cable, and shielding wire mesh must be connected to the metal case of inverter through the cable clamps on both sides, shown as Fig. 4-21.

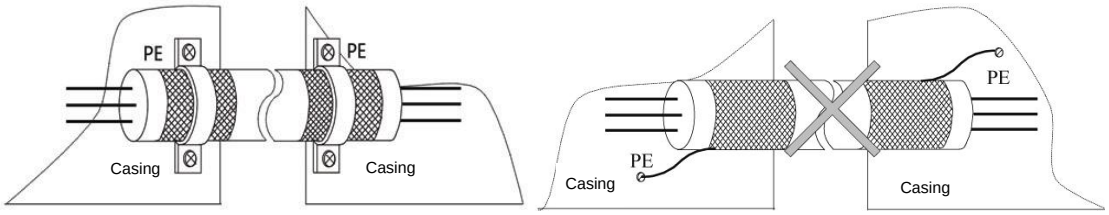



**Fig. 4-21 Contrast of grounding mode**

### 4.4.4 Proper Method against Interference

To have better anti-interference method, both inverter input and output sides are installed noise filter, and inverter is shielded in enclosed steel cabinet. See Fig. 4-22.

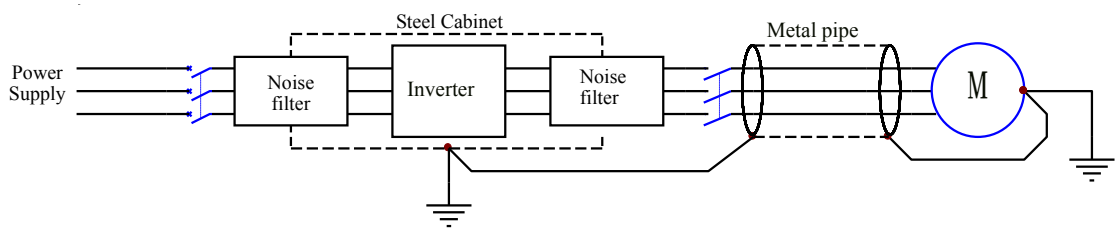



**Fig. 4-22 Better anti-interference method**

### 4.4.5 Relationship between Length of Wire and Carrier Frequency

The distributed capacitance on long cable between inverter and motor will increase higher harmonic current leakage. It may trigger output over-current protection, and causes negative impact on

peripheral equipment and motor. The length of cable between inverter and motor shall not be longer than 100m. Otherwise output side filter and reactor is needed, and carrier frequency needs to be tuned to P02.14 by referring to following table.

**Table 4.14 The cable length between inverter and motor**

| Wire Distance between inverter and motor | Less than 100m | Over 100m |
|---|---|---|
| Carrier frequency | Below 8kHz | Below 5kHz |

## 4.5 Control Circuit Terminal Wiring

### 4.5.1 Line-up of Control Circuit Terminals

Layout of control circuit terminals, see Fig. 4-23.

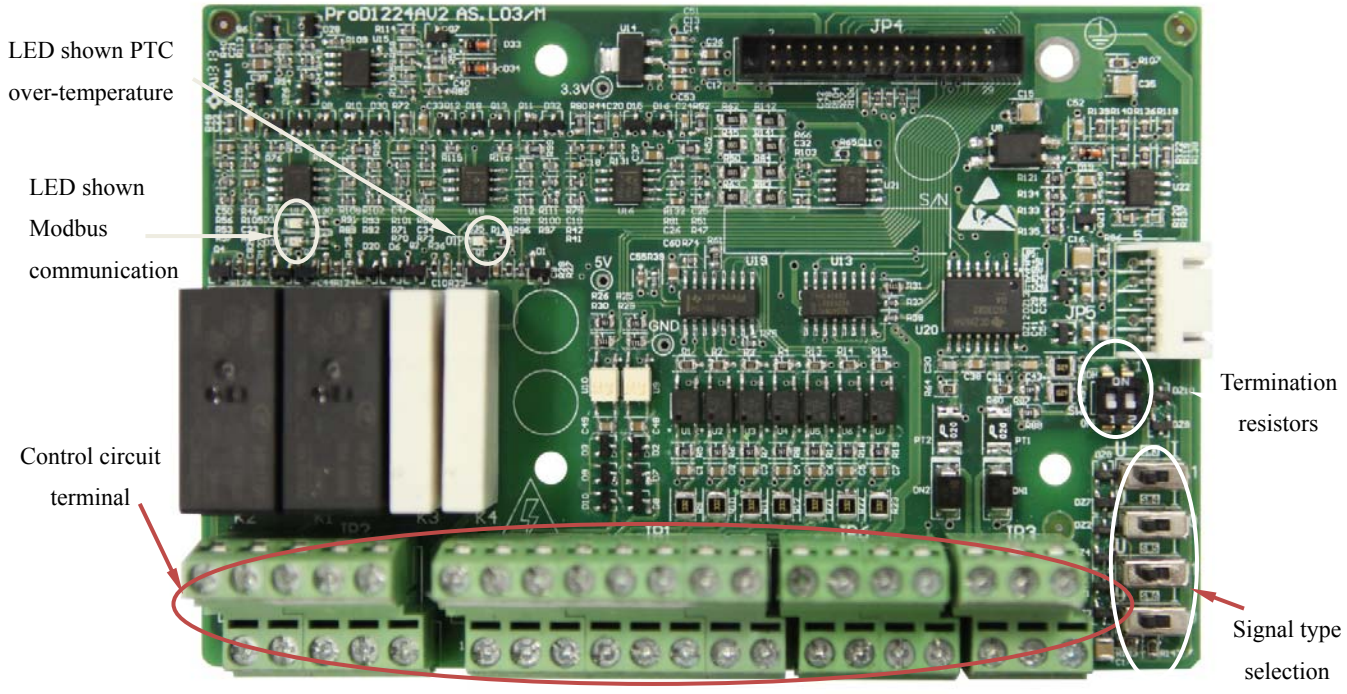



**Fig. 4-23 Picture of control circuit terminals**

A0/A1 is able to input analog voltage signal (-10V~+10V) or analog current signal (0~20mA), with its input mode to be determined by the toggle switch of each port.

M0/M1 is able to output analog voltage signal (-10V~+10V) or analog current signal (0~20mA), with its output mode to be determined by the toggle switch of each port.

When the switch is toggled to U, its corresponding port will be at voltage working mode; while it is toggled to I, its corresponding port will be at current working mode. Toggle switch of I/O voltage/ current is arranged as Fig. 4-24:

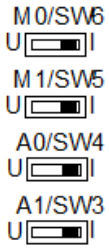



**Fig. 4-24 Selection detail of signal type**



## 4.5.2 Control Circuit Terminal Label

Labels of control circuit terminal, see Fig. 4-25.

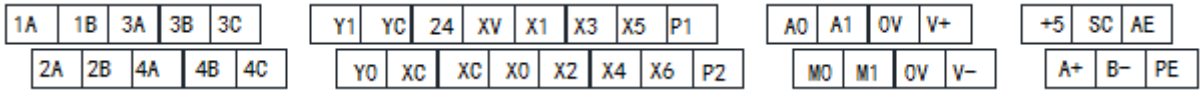



**Fig. 4-25 Control circuit terminal label**

## 4.5.3 Functional Description for Terminals of the Control Circuit

Functional description for terminals of the control loop refers to Table 4-15.

**Table 4-15 Functional description for terminals of the control circuit**

<table>
<tr><th>Name</th><th>Terminal</th><th>Signal</th><th>Remarks</th></tr>
<tr><td rowspan="10">Digital input terminal</td><td>X0</td><td>Multi-function input 0(Function code: P30.00)</td><td rowspan="10">Input signal valid when connect closed.<br>Function is select by function code P30 group.<br>Specification for digital input circuit:<br><table><tr><td>Internal power</td><td>+24VDC</td></tr><tr><td>Max. load current</td><td>100mA</td></tr></table></td></tr>
<tr><td>X1</td><td>Multi-function input 1(Function code: P30.01)</td></tr>
<tr><td>X2</td><td>Multi-function input 2(Function code: P30.02)</td></tr>
<tr><td>X3</td><td>Multi-function input 3(Function code: P30.03)</td></tr>
<tr><td>X4</td><td>Multi-function input 4(Function code: P30.04)</td></tr>
<tr><td>X5</td><td>Multi-function input 5(Function code: P30.05)</td></tr>
<tr><td>X6</td><td>Multi-function input 6(Function code: P30.06)</td></tr>
<tr><td>24</td><td>Internal +24VDC power output</td></tr>
<tr><td>XV</td><td>Input common terminal 24V</td></tr>
<tr><td>XC</td><td>Input common terminal 0V</td></tr>
</table>

<table>
<tr><td rowspan="5">Analog input terminal</td><td>A0</td><td>Multi-function analog input 0<br>(Function code: P32.01)</td><td rowspan="2">External analog voltage/current input,<br>Analog voltage level range: -10+10V or 0~10V, Rin=34Ω,<br>Analog current level range: 0~20mA or 4~20mA, Rin=120Ω<br>can be used as input signal for given analog speed</td></tr>
<tr><td>A1</td><td>Multi-function analog input 1<br>(Function code: P32.07)</td></tr>
<tr><td>V＋</td><td>+10V Power output</td><td>Analog input +10VDC at power output side, max allowed current: 20mA</td></tr>
<tr><td>V－</td><td>-10V Power input</td><td>Analog input -10VDC at power output side, max allowed current: 20mA</td></tr>
<tr><td>0V</td><td>Reference ground for analog input</td><td>Reference ground for analog input</td></tr>
<tr><td rowspan="4">Relay output terminal</td><td>1A<br>1B</td><td>Programmable relay output<br>(Function code: P31.00)<br>NO（Normally Open contact）</td><td rowspan="2">Programmable relay output function can be selected from function code P31 group..<br>The contact specification for a pair of switching contacts is as follows:<table><tr><th>Item</th><td>Specification</td></tr><tr><th>Rate capacity</th><td>Inductance:1.5A/250VAC</td></tr><tr><th>Switch frequency 120/min</th><td>Failure rate “P” 10mA/5V</td></tr><tr><th>Response time</th><td>Less than 10ms</td></tr></table></td></tr>
<tr><td>2A<br>2B</td><td>Programmable relay output<br>(Function code: P31.01)<br>NO（Normally Open</td></tr>
<tr><td>3A<br>3B<br>3C</td><td>Programmable relay output<br>(Function code: P31.02)<br>3A-3B：NO（Normally Open contact）<br>3B-3C：NC（Normally Closed contact）</td><td rowspan="2">Programmable relay output function can be selected from function code P31 group..<br>The contact specification for a pair of switching contacts is as follows:<table><tr><th>Item</th><td>Specification</td></tr><tr><th>Rate capacity</th><td>Resistive:<br>4.5A 250VAC/30VAC<br>Inductance:<br>0.4A 250VAC/30VDC</td></tr><tr><th>Switch frequency 120/min</th><td>Failure rate “P” 10mA/5V</td></tr><tr><th>Response time</th><td>Less than 10ms</td></tr></table></td></tr>
<tr><td>4A<br>4B<br>4C</td><td>Programmable relay output<br>(Function code: P31.03)<br>4A-4B：NO（Normally Open contact）<br>4B-4C：NC（Normally Closed contact）</td></tr>
</table>

<table>
<tr><td rowspan="3">Transistor open collector terminals</td><td>Y0</td><td>Programmable open collector output 1 (Function Code: P31.04)</td><td rowspan="3">Programmable open collector output function can be select by function code P31。<br>Capable drive: less than DC30V, 50mA</td></tr>
<tr><td>Y1</td><td>Programmable open collector output 2 (Function Code: P31.05)</td></tr>
<tr><td>YC</td><td>Programmable open collector output common terminal</td></tr>
<tr><td rowspan="3">Analog output terminal</td><td>M0</td><td>Programmable analog output 1 (Function code: P33.00)</td><td rowspan="2">Analog voltage/current output:<br>Analog voltage output: -10+10V or 0~10V, RL≥1kΩ,<br>Analog current output: 0~20mA or 4~20mA, RL≤500Ω<br>It can output to monitor or other device input.</td></tr>
<tr><td>M1</td><td>Programmable analog output 2 (Function code: P33.03)</td></tr>
<tr><td>0V</td><td>Reference ground of analog output signal</td><td>Analog output signal reference ground</td></tr>
<tr><td>High temperature protection terminal</td><td>P1, P2</td><td>PTC functional connection port (Function code P30.07)</td><td>Model of the matched temperature sensor: PT1000<br>High temperature protection point: 120℃<br><table><tr><td>Status indicator (green) D35</td><td>ON: normal temperature<br>OFF: high temperature protection</td></tr></table></td></tr>
<tr><td rowspan="4">Modbus communication terminal</td><td>A+</td><td>Modbus communication signal +</td><td rowspan="2">Signal terminal of Modbus communication<br><table><tr><td rowspan="4">Communication status indicator</td><td rowspan="2">Yellow (TX) D36</td><td>ON: IO board is sending data to the bus</td></tr><tr><td>OFF: IO board isn’t in sending status</td></tr><tr><td rowspan="2">Green (TX) D37</td><td>ON: IO board is receiving data from the bus</td></tr><tr><td>OFF: IO board isn’t in receiving status</td></tr></table></td></tr>
<tr><td>B-</td><td>Modbus communication signal-</td></tr>
<tr><td>+5</td><td>Signal power +5V</td><td>Communication signal isolating power 5V, 100mA</td></tr>
<tr><td>SC</td><td>Signal ground</td><td>Modbus communication signal ground</td></tr>
<tr><td rowspan="2">Grounding terminal</td><td>AE</td><td>RC grounding terminal</td><td>Shielding layer will be grounded via RC loop in the places with long communication line and serious interference</td></tr>
<tr><td>PE</td><td>Direct grounding terminal</td><td>Direct grounding, suitable for the places with good grounding condition. Analog and shielding layer of the communication line are grounded.</td></tr>
</table>

### 4.5.4 Control Circuit Wire Specification

600V plastic insulated copper conductor cable is used for control circuit. Specification of wire and tightening torque, see Table 4-16.

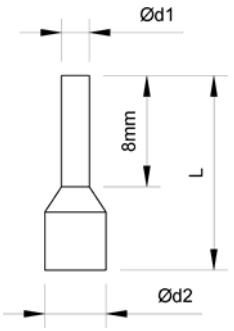
**Table 4-16 Wire Specification and Tightening Torque**

| Model | Allowable wire ($mm^2$) | Recommended wire ($mm^2$) | Tightening Torque (N.m) |
|---|---|---|---|
| Whole AS450 series | 0.75～1 | 0.75 | 1.5 |

The wire sizes are determined under the ambient temperature of 50℃, wire temperature of 75℃.

Control circuit connection is recommended to use bar shaped terminal. Specification of bar shaped terminal, see Table 4-17.

**Table 4-17 Specification – Bar shaped terminal**

| Cross Section area $mm^2$（AWG） | d1（mm） | d2（mm） | L（mm） | Illustration |
|---|---|---|---|---|
| 0.25（24） | 0.8 | 2 | 12.5 |  |
| 0.5（20） | 1.1 | 2.5 | 14 | |
| 0.75（18） | 1.3 | 2.8 | 14 | |
| 1.5（16） | 1.8 | 3.4 | 14 | |
| 2（14） | 2.3 | 4.2 | 14 | |

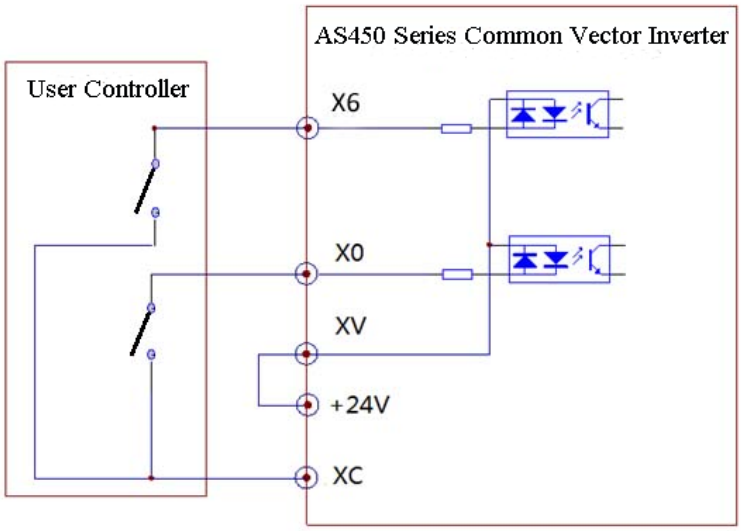


### 4.5.5 Detailed Wiring Description for Terminals of the Control Loop

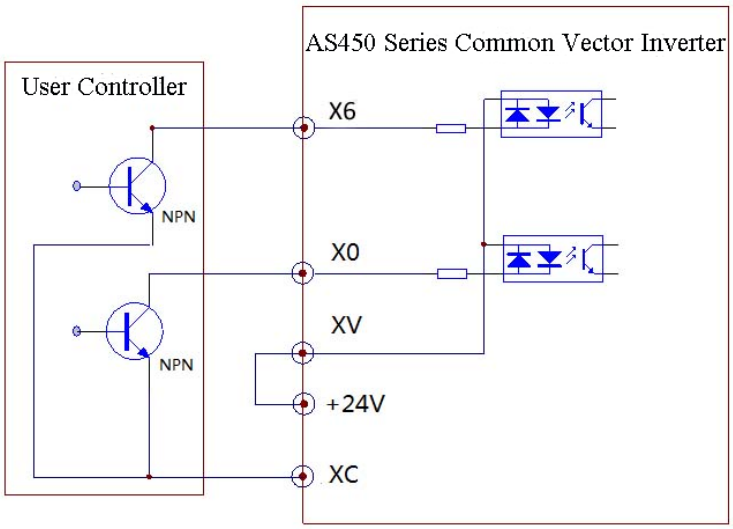
4.5.5.1 Digital Input Terminal

The specific connection mode:

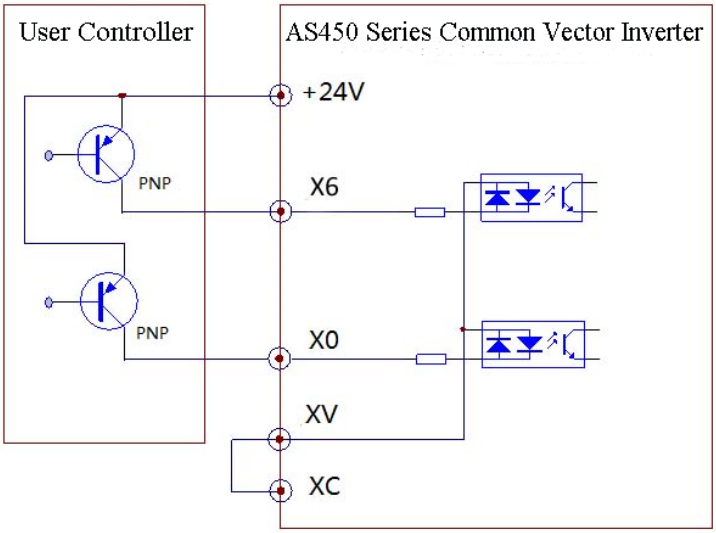
- Use the internal +24V power supply of the inverter, the outer controller is passive contact connection mode



- Use the internal +24V power supply of the inverter, the outer controller is NPN sink current connection mode.

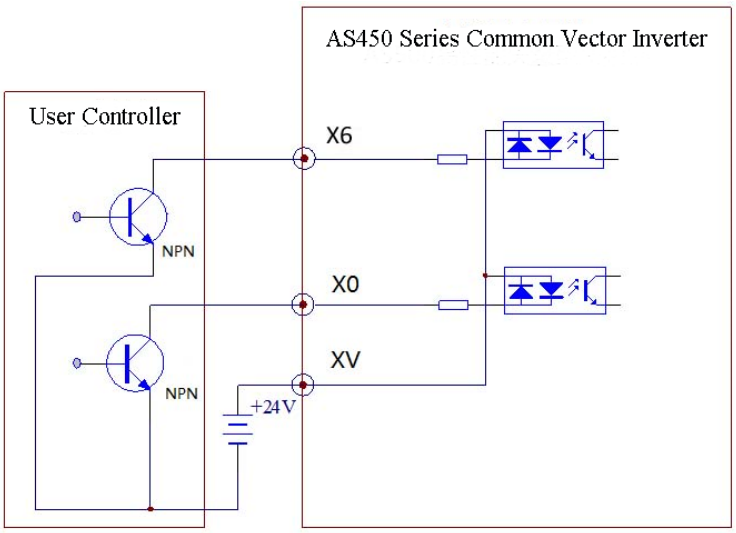



- Use the internal +24V power supply of the inverter, the outer controller is PNP source current connection mode.



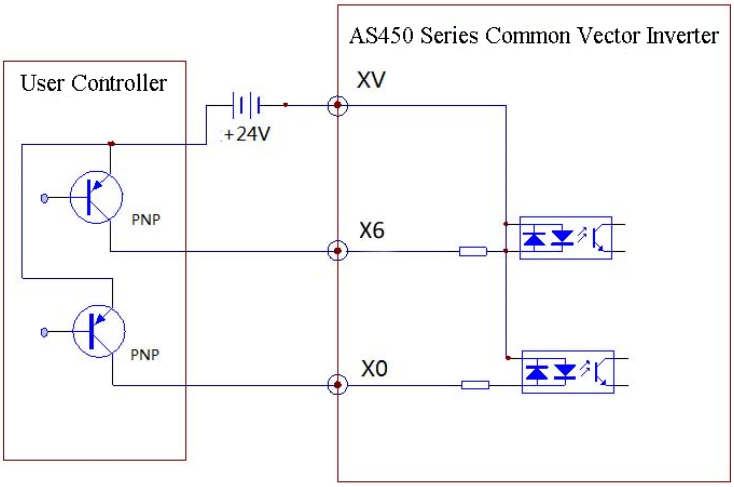

**Note:** be sure to remove the short circuit lug between terminals +24V and XV, and short connect XC and XV.

- Use the external power supply connection mode, the outer controller is NPN sink current connection mode.




**Note:** be sure to remove the short circuit lug between terminals +24V and XV.

■ Use the external power supply, outer controller is PNP source current connection mode.




**Note:** Be sure to remove the short circuit lug between terminals +24V and XV.

4.5.5.2 Analog Input Terminal

There are two input ports A0 and A1 for analog signal in this inverter, with signal type of optional voltage/current; voltage signal range -10V ~ +10V and current signal range 0~20mA.

When using analog input signals, parameters from P32.00 to P32.11 can be set to select parameters, such as gain, offset, and signal filtering time of each corresponding signal input port, so that analog input port can be use better. Refer to chapter “7.6.3” in detail.

The cable connecting analog signal and inverter should be as short as possible (no longer than 30m) while connecting analog signal, and should use shielded cable. Shielded cable should be grounded and connected to 0V terminal on inverter analog output.

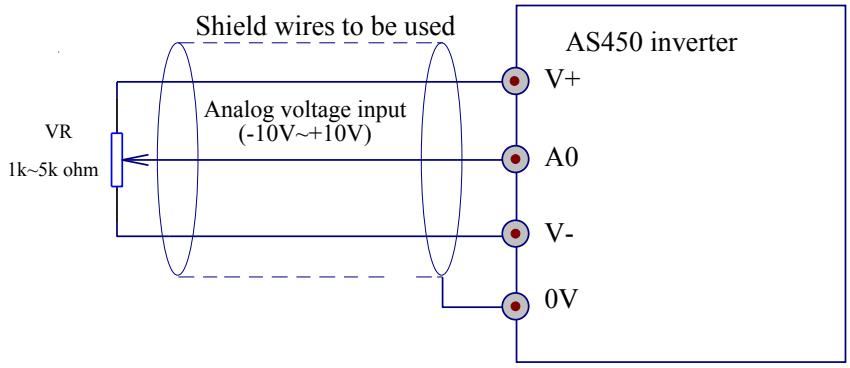



**Fig. 4.26 Diagram for analog signal shielded cable connection**

In Fig. 4-26, analog voltage signal is supplied by inverter, and its voltage range is -10V ~ +10V. In reality, most analog voltage signal is supplied by controller who sends out analog signal. If it is voltage signal, 0~10V is taken in most cases, the connection diagram, see Fig. 4-27. If it is current signal, 0mA~24mA is taken in most cases, the connection diagram, see Fig. 4-28.

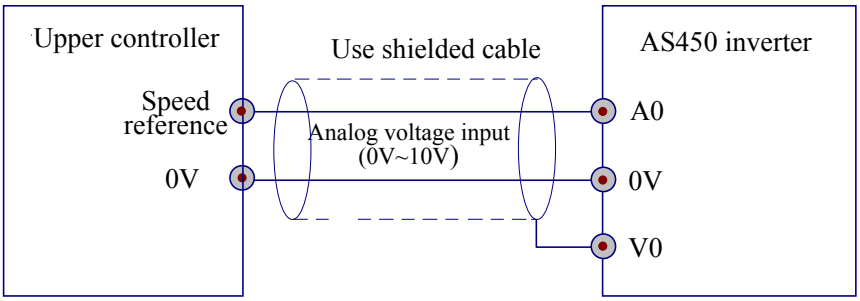



**Fig. 4.27 Diagram for AIO cable connection with voltage signal**

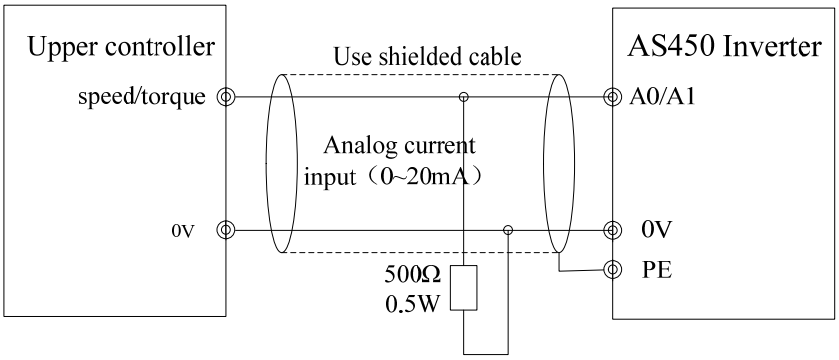



**Fig. 4.28 Diagram for AIO cable connection with current signal**

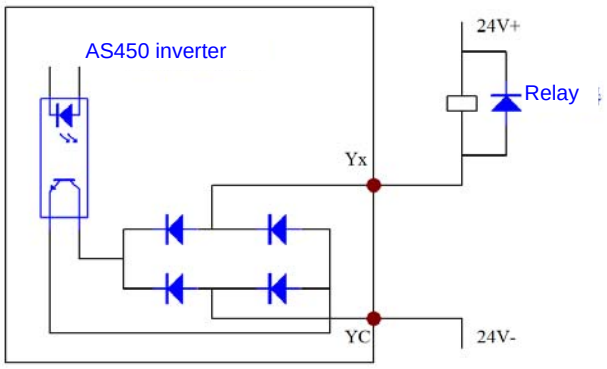
4.5.5.3 Digital Output Terminal

Digital output terminal has two parts, relay contact output terminal and open collector output terminal. Each digital output terminal can define input function by setting parameter based on function code P31. The value of code P31 ranges from 0 to 63. Each number refers to Parameter group P31.

Notice: Open collector output uses the external power supply, note the polarity of the power

supply for connection to the external power supply. The output of the specifications of the power supply for the maximum voltage + 30 VDC, maximum load current 50 mA, beyond which specification is in danger of damage output circuit.

- Use the external +24V power supply of the inverter, multifunctional collector open output terminal connection mode




Note: if terminal Y0 or Y1 is damaged when this wiring mode is adopted, be sure to confirm whether polarity of the outer diode is correct.

4.5.5.4 Multi-function Analog Output Terminal

Multi-function analog output can define input function by setting parameter based on function code P33.00 and P33.03. The value of code ranges from 0 to 16. Each number refers to the following function and the corresponding output (P33.00 refers to M0, P33.03 refers to M1):

- no definition;
- 1: output current;
- 2: output voltage;
- 3: torque given ;
- 4: busbar voltage;
- 5: output total power;
- 6. output active power;
- 7: speed(unsigned);
- 8: given speed (signed);
- 9: feedback of speed regulator(signed);
- 10: heating rate
- 11: radiator temperature
- 12: Analog A0
- 13: Analog A1
- 14: Analog A2

See chapter 7, “7.6.4 Analog output function Parameter I” for more information.

### 4.5.6 Other Remarks for Wiring

Control terminal wiring must keep far away from power cable in main circuit, or wrong action may be triggered due to the electromagnetic interference.

## 4.6 The Wiring of PG Card Terminals

To adopt different kind encoder, 3 types of PG cards are available. See Table 4-18:

**Table 4-18 The types of PG card**

| PG Card Type | Model | Input signal | Remarks |
|---|---|---|---|
| incremental ABZ | AS.T025、AS.L06/G<br>AS.T041、AS.L06/F | Open collector,<br>push-pull | AS.T025(12V)<br>AS.T041 (5V） |
| RESOLVER | AS.L06/E | RESOLVER differential | |

### 4.6.1 PG Card Incremental ABZ

Incremental ABZ 12V PG card (AS.T025) can receive two kinds encoder signal. It can talk to the encoder with open collector signal and push-pull signal.

4.6.1.1 Line-up Terminal for Incremental ABZ PG Card

Terminal line up for incremental ABZ 12V PG card (AT.T025), see Fig. 4-29.

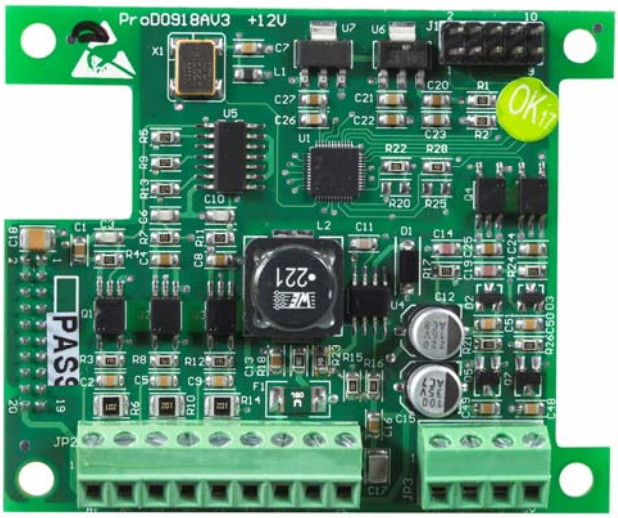



**Fig. 4-29 Terminal line up for incremental ABZ PG card**

4.6.1.2 Incremental ABZ 12V PG Card Terminal Label

Terminal label for incremental ABZ 12V PG card is as follows:

JP3 divided frequency output terminal:

| | | | |
|---|---|---|---|
| FA | V0 | FB | V0 |

JP2 input terminal:

| A+ | A- | B+ | B- | Z+ | Z- | V+ | V- | PE |
|---|---|---|---|---|---|---|---|---|

4.6.1.3 Incremental ABZ PG Card Terminal Function Specification

Incremental ABZ PG card terminal function specification, see Table 4-19.

**Table 4-19 Incremental ABZ PG card terminal function specification**

| Name | Pin No | Label | Function | Specification |
|---|---|---|---|---|
| Divided frequency output | JP3.1 | FA | Divided frequency output, phase A | Triode open collector (max. output frequency 100kHz) |
| | JP3.2 | 0V | 24V GND | |
| | JP3.3 | FB | Divided frequency output, phase B | |
| | JP3.4 | 0V | 24V GND | |
| Encoder input | JP2.1 | A+ | Phase A signal + | Open collector/push-puff, max input frequency 100kHz |
| | JP2.2 | A- | Phase A signal - | |
| | JP2.3 | B+ | Phase B signal + | |
| | JP2.4 | B- | Phase B signal - | |
| | JP2.5 | Z+ | Phase Z signal + | |
| | JP2.6 | Z- | Phase Z signal - | |
| | JP2.7 | V＋ | Anode of encoder power | Voltage: 12VDC, Max output current: 500mA |
| | JP2.8 | V- | Cathode of encoder power | |
| | JP2.9 | PE | Shielded ground | Grounding terminal for shielded cable |

4.6.1.4 Wire Requirement for Incremental ABZ PG Card input Terminal and Encoder Output

Incremental ABZ PG card can receive two kinds encoder signals: open collector signal and push-pull signal. Encoder wiring by open collector signal, see Fig. 4-30.

Note: PE is the grounding terminal of inverter closer.

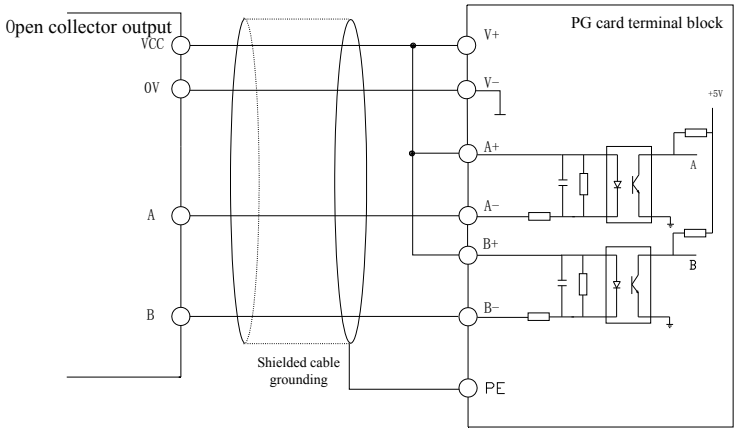



**Fig. 4-30 Wiring with encoder open collector signal**

Encoder wiring by push-pull signal, see Fig. 4-31.

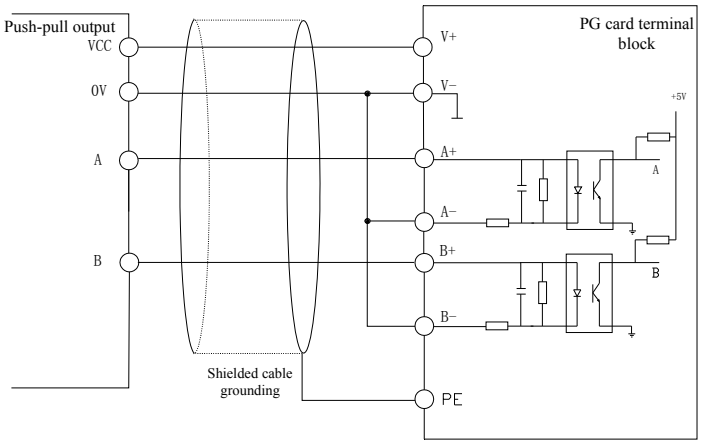



**Fig. 4-31 Wiring with encoder push-pull signal**

## 4.6.2 RESOLVER PG Card

Resolver card (AS.L06/E) can receive differential signals from resolver encoder.

4.6.3.1 Line-up Terminal for Resolver PG Card

Terminal line up for RESOLVER PG card, see Fig. 4-32.

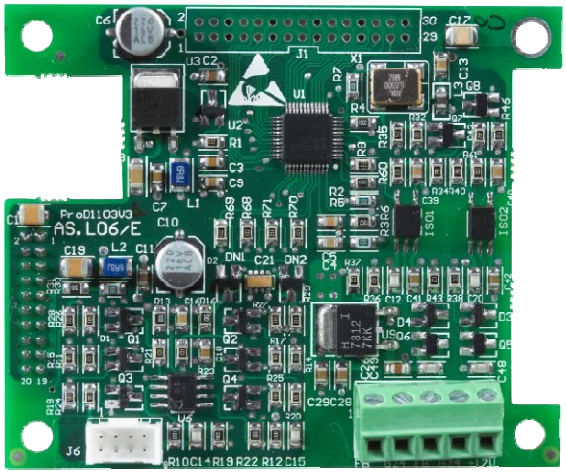



**Fig. 4-32 Terminal line up for Resolver PG card**

4.6.3.2 Resolver PG Card Terminal Label

Terminal label for Resolver PG card(AS.L06/E) is as follows:

JP3 terminal:

| | | | | |
|---|---|---|---|---|
| FA | G24 | FB | G24 | +12 |

JP2 terminal (6 pin socket):

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| OUT+ | OUT- | SIN+ | SIN- | COS+ | COS- |

4.6.3.3 Resolver PG Card Terminal Function Specification

Resolver PG card terminal function specification, see Table 4-20.

**Table 4-20 Resolver PG card terminal function specification**

| Name | Label | Function | Specification |
|---|---|---|---|
| Open collector output | FA | Pulse output, phase A | Triode open collector output, pulse volume is proportional to the motor rotation speed, coefficient of 1024 p/r, max output. current 20mA |
| | G24 | 12V GND | |
| | FB | Pulse output, phase B | |
| | G24 | 12V GND | |
| | +12V | +12V power output | |
| Encoder input | OUT+，OUT- | Drive signal of encoder | The highest support of 20000 rpm (2P spin variable conditions) |
| | SIN+,SIN- | SIN signal of encoder | |
| | COS+,COS- | COS signal of encoder | |

Need to configure spin variable connect wire（3m or 5m）:

Spin variable connect wire（3m） type：AS.L06/E.42-002 Material No.：H61002079

Spin variable connect wire（5m） type：AS.L06/E.42-003 Material No.：H6100208

The definition of spin variable connect wire is as follows:

| Line label | OUT+ | OUT- | SIN+ | SIN- | COS+ | COS- |
|---|---|---|---|---|---|---|
| Color | Red | White | Yellow | Black | Orange | Brown |

### 4.6.3 Precaution for PG Card Terminal Wiring

# Important

Encoder signal cable must be separated from main circuit and other power lines. Never running those two cables in parallel in short distance. Shielded cable should be used for encoder, and shielded layer needs to be grounded to the grounding PE of the outer case.

# Chapter 5 Commissioning and Test Run

In the following chapters, noun description relating to control, running and status of the inverter will be mentioned many times. Please carefully read the contents in this chapter prior to use of the product, to correctly understand and properly use the functions mentioned in later chapters.

**Danger**

Close input power only after the inverter casing has been installed. After electrification, don't remove the inverter casing, otherwise it may cause electric shock.

If restart for outage function is set for the inverter, don't close to the rotating mechanical equipment, to avoid personal injury caused by starting the mechanical equipment when the inverter is powered on.

Don't touch the braking resistor when dynamic braking resistor is provided, otherwise it may cause electric shock or burn.

Please be sure to confirm the permissible application scope of the motor and mechanical equipment before the inverter starts the motor and mechanical equipment, otherwise it may cause personal injury.

**Notice**

Don't examine the measurement signal when the inverter is running, otherwise it may cause equipment damage.

Be sure not to change the parameter setting of the inverter at will, otherwise the proper operation effect can't be met, with damage to the transmission equipment.

Be sure to have switching commissioning firstly before run command channel of the inverter is switched, otherwise it may cause equipment damage and personal injury.

## 5.1 Run Command Given

As a basic tool for the inverter operation, manipulator is used to observe different status and fault code of the inverter, as well as set and view its various parameters. In this chapter, basic operation method of the manipulator is described in details.

### 5.1.1 Run Command Channel of the Inverter

It assigns the inverter to receive run command: physical channel for start, stop and so on. The run command channels are divided into:

Operation panel: control by use of RUN, STOP and LOC/REM keys on it

Control terminal: control by use of control terminals X0~X6 (digital) and A0~A1 (analog)

Communication port: start and stop the control by use of control terminals A+ and B- (Modbus)

with upper computer.

Selection of command channel can be set through function code P10.02.

Note: before the command channel is switched, be sure to have switching commissioning firstly, otherwise it may cause equipment damage and personal injury.

### 5.1.2 Frequency Given Channel of the Inverter

There are 4 frequency given physical channels when AS450 is in normal operation mode:

Operation panel ▲ and ▼ keys given,

Terminal given,

Communication given,

Analog voltage or current given.

### 5.1.3 Working Status of the Inverter

Working status of AS450 includes stop status and running status.

Stop status: after the inverter is powered on and initialized, if no any run command is input or stop command is executed during running, then it will enter stop status immediately.

Running status: the inverter will enter running status after it receives run command.

### 5.1.4 Run Mode of the Inverter

Inching run shares the highest priority.

Closed loop run: selection function of the closed loop is effective (P51.00=1). The inverter will choose closed loop run mode, to have PID regulation based on given and feedback quantity (refer to function code in P51 group).

Multi-speed run: select multi-frequency 0 ~ 7 (P41.00 ~ P41.07) by use of combined open/close the multifunctional terminals (functions 3, 4 and 5) to realize multi-speed run.

Normal run: the simple open loop run mode.

## 5.2 Operation Guide

As a basic tool for the inverter operation, manipulator is used to observe different status and fault code of the inverter, as well as set and view its various parameters. In this chapter, basic operation method of the manipulator is described in details.

The user can execute the following through the operation panel:

- Motor status monitoring
- Motor self-tuning
- Motor run control (start/stop, speed, forward/reverse)
- View and answer the fault or alarm

- Set and modify the parameters
- Switching between local mode and remote mode

### 5.2.1 Function for Individual Parts of the Operator

Refer to the Fig. 5-1 for each parts of operator and its function.

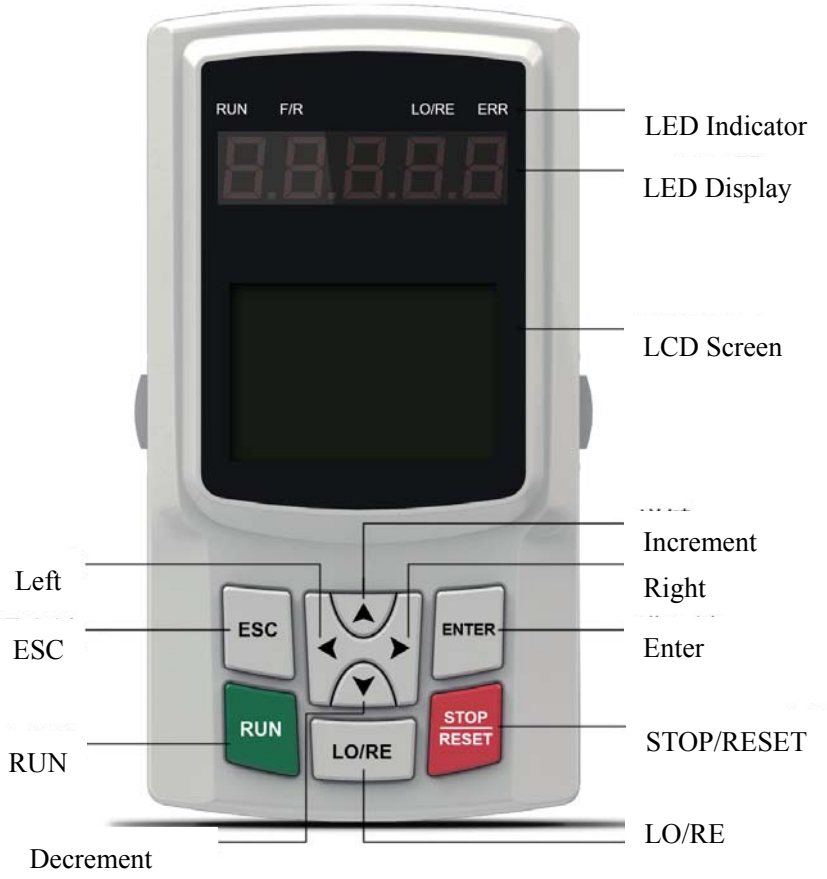



**Fig. 5-1 Names and functions of each parts of the operator**

### 5.2.2 LED Indicator

The operator have 4 LED indicators, D1 (RUN), D2 (F/R), D3 (LO/RE) and D4 (ERR). These indicators show the motor status. Refer to Table 5-1 for the relationships between indicators and motor status.

**Table 5-1 Motor status indication**

| Status | D1（RUN） | D2（F/R） | D3（LO/RE） | D4（ERR） |
|---|---|---|---|---|
| Forward | On | On | Off | Off |
| Reverse | On | Off | Off | Off |
| Fault/Warning | Off | —— | —— | Flashing |
| Panel operation | On | On/off | On | Off |

### 5.2.3 LED Digital Tube

There are 4 LED digital tubes below the indicators and displaying real time motor speed at the default interface. The content of display can be changed by selecting different parameters.

### 5.2.4 LCD Display

In middle of operator you can find a LCD screen. This is the main screen to display and set the parameter of the inverter, and to view the fault code of the inverter.

### 5.2.4 Keyboard

There are 9 keys at lower part of the operator. Function of those keys, see Table 5-2

**Table 5-2 Key function**

| Key | Name | Function |
|---|---|---|
| > | Right | In 【Function Select】mode: To select the next function group;<br>In 【Parameter setting】mode: To move the cursor to the right; |
| < | Left | In 【Function Select】mode: To select the previous function group;<br>In 【Parameter setting】mode: To move the cursor to the left; |
| ^ | Increment | In 【Function Select】mode: To select the previous function code;<br>In 【Parameter setting】mode: To increase the value; |
| v | Decrement | In 【Function Select】mode: To select the next function code;<br>In 【Parameter setting】mode: To decrease the value; |
| ENTER | Enter | In 【Monitoring】mode: To enter the function selecting interface;<br>In 【Function Select】mode: To enter the selected function interface; |
| ESC | ESC | In 【Function Select】mode: back to 【Monitoring】 mode;<br>In all operational sites: beck to 【Function Select】mode. |
| RUN | RUN | In LOCAL control mode: “RUN” function; |
| STOP RESET | STOP/RESET | In LOCAL control mode: “STOP” function;<br>In Fault stop status: “RESET” function |
| LO/RE | LO/RE | Operation mode switch between operator (LOCAL) and control circuit terminal (REMOTE). |

## 5.3 Operation

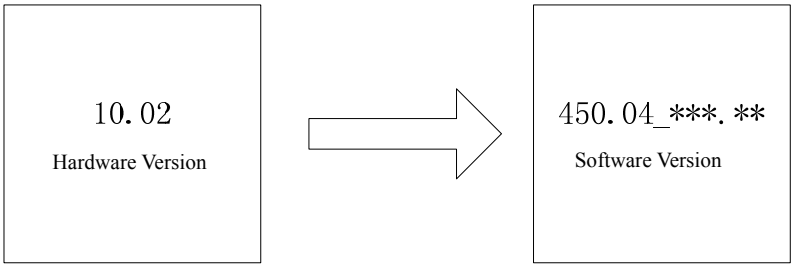
Monitoring status, function selection and parameter setting are provided on the operator. Menu of the operator is displayed in Chinese and English, which is set as Chinese at factory, but it may be switched to English by setting the parameter value in “language selection” of the advanced menu.

### 5.3.1 Power On and Initialization

When the operator is powered on for the first time, it needs to adjust brightness of the operator LCD via left shift key and right shift key, with the former to reduce brightness, while the latter to increase brightness.

After the operator is powered on, there is several seconds for its initialization. During this process, operator LCD will display [startup picture].

Startup picture is as the following:




**Note:** the screen enters monitoring status after the software version number is displayed.

### 5.3.2 Display After Power On

Screen shows “Monitoring” state 5 seconds after power on. The screen default displays the current reference speed (Vref), feedback speed (Vfbk) and current states (Irms).

### 5.3.3 【Monitor State】 In Detail

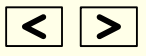
Monitoring interface can be switched by pressing  , or  in 【Monitor State】. 14 real time data of motor status are displayed in screen by default. These data is for display only but can’t be modified.

**Table 5-3 Comparison table for default operation data**

| Display | Name | Explanation | Range | Unit | Factory Default | Remarks |
|---|---|---|---|---|---|---|
| Vobj | Target speed | Display the target speed of the motor | × | rpm | × | |
| Vref | Given speed | Display the given speed | | | | |
| Vfbk | Feedback speed | Display feedback speed of the motor | × | rpm | × | |
| Irms | Output current | Display output current | × | A | × | |
| Torq | Output torque | Display output torque | × | % | × | |
| Tzero | Zero servo torque | Display zero servo torque at starting | × | % | × | |
| Udc | DC Bus voltage | Display DC voltage of inverter main circuit | × | V | × | |
| Uout | Output voltage | Display inverter output voltage | × | V | × | |
| A0 | A0 input voltage | Display input voltage of inverter analog input 0 (A0) | × | V | × | |

| Display | Name | Explanation | Range | Unit | Factory Default | Remarks |
|---|---|---|---|---|---|---|
| AI1 | A1 input voltage | Display input voltage of inverter analog input 1 (A1) | × | V | × | |
| PIDRef | Process closed loop PID given | Display the current PID given value | × | V (default) | × | |
| PIDFbk | Process closed loop PID feedback | Display the current PID feedback value | × | V (default) | × | |
| DI | Input X0-X7 status | Display the input status of terminals X0-X6, as "XXXXXXXX", where "X" = 0, indicating no input, "X" = 1, indicating input | × | × | × | |
| DO | Output K1-K4 and Y0、Y1 status | Display the output status of terminals K1-K4, Y0, Y1, as "XXXXXX", where "X" = 0, indicating no output, "X" = 1, indicating output | × | × | × | |



### 5.3.4 【Control Panel】 In Detail

Press LO/RE in "Monitoring" interface can switch operation mode between "Monitoring" and "Control Panel". In "Control Panel" mode LED indicator D3 will be on. Press RUN at that time may control inverter into operation state, LED indicator D1 in operator will be on. Inverter enters in stop state by pressing STOP RESET, LED indicator D1 will be off. Press ∧ and ∨ in "Control Panel" interface can switch the monitored contents. In this interface there are 2 panel adjustable parameters and 4 real time operation data. Panel adjustable speed (Vref) and motor moving direction (Vdir) can be modified, other 4 data are displayed only but can't be modified.

**Table 5-4 Comparison table for control panel data**

| Display | Name | Explanation | Range | Unit | Factory Default | Remarks |
|---|---|---|---|---|---|---|
| Vref | Panel controlled speed | Set speed reference in panel operation | 0.00～50.00 | Hz | 5.00 | |
| Vfbk | Feedback speed | Display motor feedback speed | × | Hz | × | |
| Irms | Output current | Display output current | × | A | × | |
| Vdir | Motor moving direction | Set motor rotating to forward or reverse direction | 0～1 | × | 1 | |
| Udc | DC Bus voltage | Display DC voltage of inverter main circuit | × | V | × | |
| Uout | Output voltage | Display inverter output voltage | × | V | × | |

### 5.3.5 Operation Mode

Operator has 5 operating modes. They are 【Parameter Setting】, 【Motor Tuning】, 【Fault Check】, 【Parameter Processing】 and 【Modified Parameters】. In any monitoring interface, press ENTER can enter into following "Function Select" interface:

* 1: Parameter Setting
2: Motor Tuning
3: Fault Check
4: Parameter Processing
5: Modified Parameters

5.3.5.1【Parameter Setting】

Parameters are modified in 【Parameter Setting】mode. The setting range of parameter refers to chapter 6.

In 【Parameter Setting】mode, to select parameter group by pressing < or >, select parameter code by pressing ^ or v. Press ENTER to confirm the parameter to be modified. A cursor that indicats the position to be modified is displayed on selected parameter. Press < or > to move the cursor and change the modified position, press ^ or v to increase/decrease the modified value. Then press ENTER to confirm the modification, modification is invalid if ENTER is not pressed. Press ESC and return to previous menu.

5.3.5.2 【Motor Tuning】

1: Parameter Setting
* 2: Motor Tuning
3: Fault Check
4: Parameter Processing
5: Modified Parameters

In 【Motor Tuning】 mode, the parameters for motor (asynchronous) and encoder phase angle can be retrieved manually by self-learning. Self-learning mode can be selected by modifying X value in ATun = X. Press ENTER, a cursor is displayed on the parameter to be modified. Press ^ or v to select self-learning mode. Then press ENTER to confirm. There are 7 self-learning modes. They are:

0: normal operation

1: static encoder self-learning

2: encoder modification

3: end of encoder self-learning

4: static motor self-learning

5: inverter optimised self-learning

6: static motor advanced learning

7: dynamic encoder self-learning

Press ESC and return to previous menu.

5.3.5.3 【Fault Check】

1: Parameter Setting

2: Motor Tuning

* 3: Fault Check

4: Parameter Processing

5: Modified Parameters

In 【Fault Check】 mode, records of voltage, current, speed reference, feedback speed and content for latest 8 faults are displayed. In main interface, press ENTER to display ER0=X, then press ^ or v and display changes from ER0 to ER7. ER0 is the latest fault, ER7 is the earliest one. X stands for the fault code in current fault index. The explanation of this fault is displayed underneath at the same time. Press on more time ENTER in fault code display screen, current DC Bus voltage (Ude), output current (Irms), speed reference (Vref) and feedback speed (Vfbk) are displayed. Press ENTER again and return to fault code display screen. Press ESC and return to previous menu.

5.3.5.4 【Parameter Processing】

1: Parameter Setting

2: Motor Tuning

3: Fault Check

* 4: Parameter Processing

5: Modified Parameters

In 【Parameter Processing】 mode, parameter can be uploaded, downloaded, initialized, cleared. To select proper operation mode by modifying X value in Init = X.

Press ENTER, a cursor is displayed on the parameter to be modified in position X. press ∧ or ∨ to select proper operation mode. Then press ENTER to confirm. There are 4 parameter processing modes. They are:

1: upload parameter to operator

2: download parameter to inverter

7: parameter reset

8: fault reset

Press ESC and return to previous menu.

5.3.5.5 【Modified Parameters】

1: Parameter Setting

2: Motor Tuning

3: Fault Check

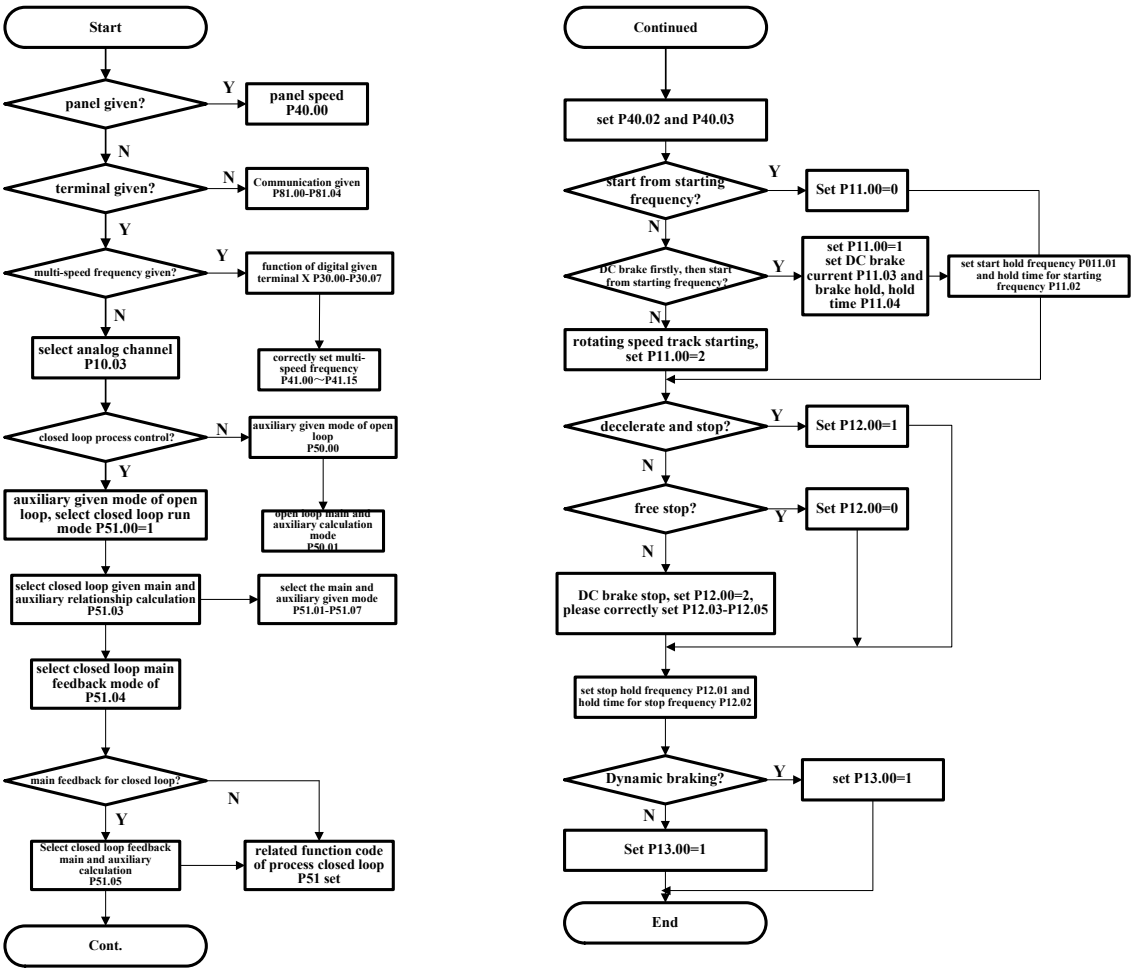
4: Parameter Processing

* 5: Modified Parameters

In【Modified Parameters】could Inquire and modify the recently modified parameters. Select the parameter code in parameter set via ∧ or ∨, then press ENTER, a cursor indicating modified bit will be shown on the parameter bit to be modified. After that, change the modified bit with < or >, and plus or minus the value with ∧ or ∨. Finally press ENTER to confirm the modification, otherwise it will be invalid.

Press ESC to return to the previous menu.

# 5.4 Fast Commissioning for V/F Control

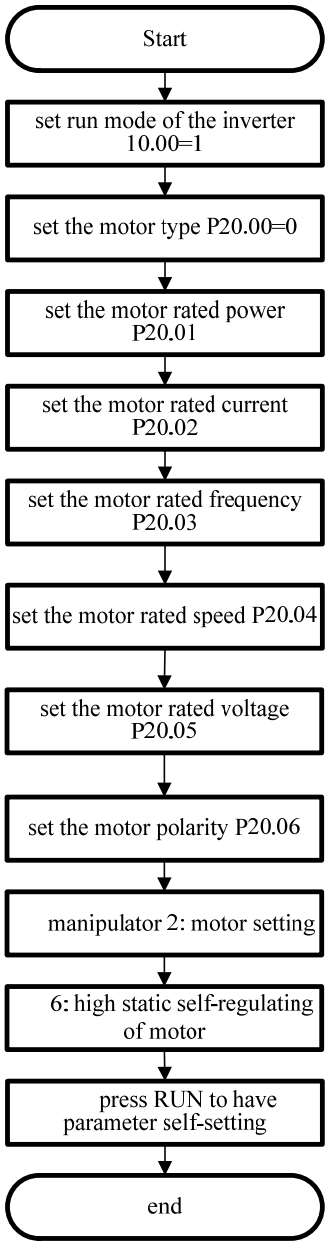


## 5.5 Fast Commissioning for Vector Control

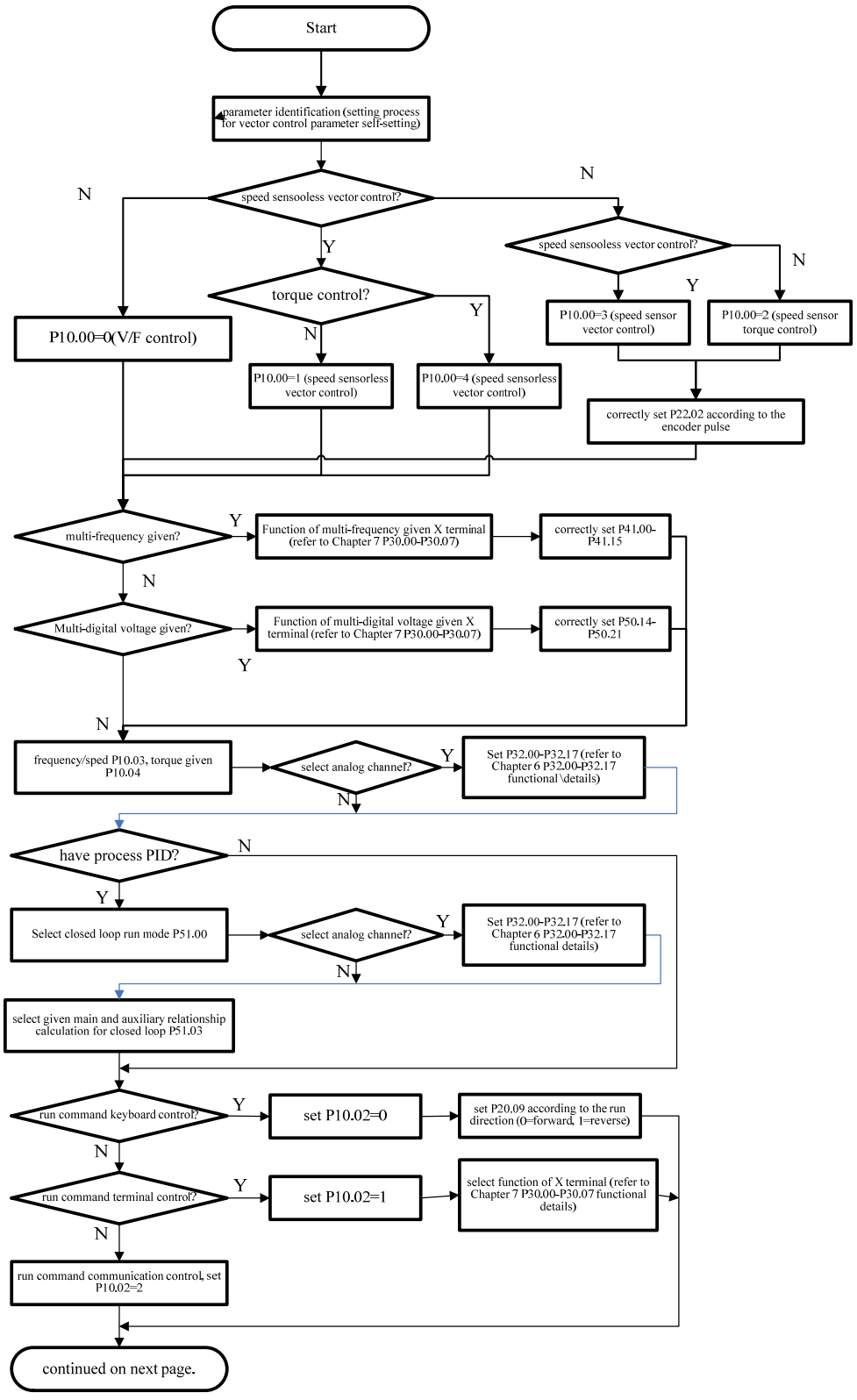
Introduce the fast commissioning method for vector control taking the vector control without PG as an example. IF “Vector Control with PG” is used, it needs to set encoder parameter according to P22 “Encoder Parameter” of this manual.

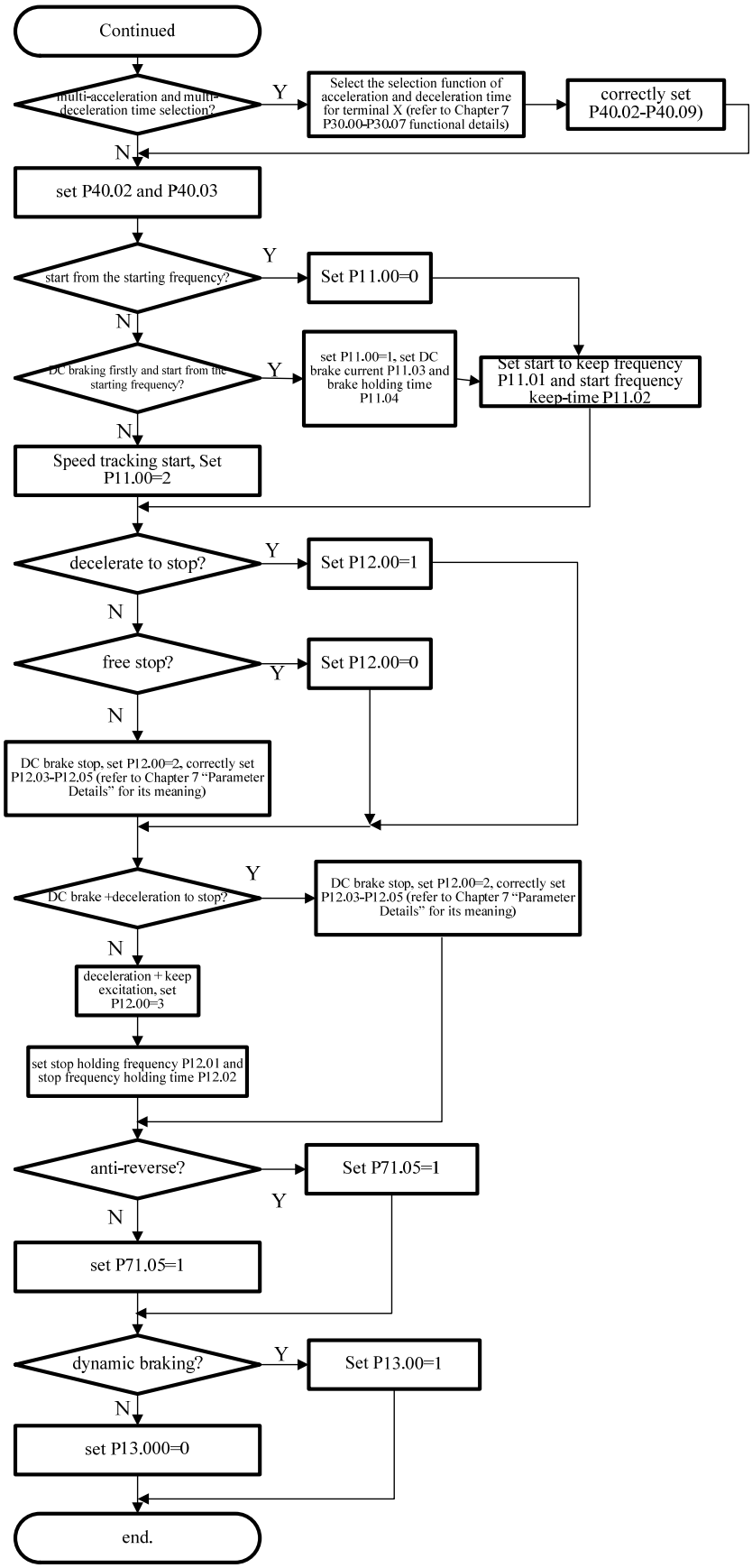
1. P20.10 “motor no-load current coefficient”: adjust the magnetic flux intensity, making the current of the motor running at low speed (other than flux-weakening area) in vector control mode is similar to its no-load current.

2. Motor parameter self-tuning: static motor parameter self-tuning is required for vector control, the details are:



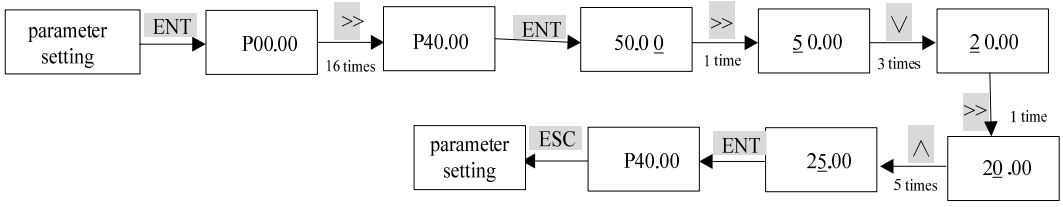
3. Control process for vector control. Please note that self-tuning must be executed during vector control.




Continued
multi-acceleration and multi-deceleration time selection?
Y
Select the selection function of acceleration and deceleration time for terminal X (refer to Chapter 7 P30.00-P30.07 functional details)
correctly set P40.02-P40.09)
N
set P40.02 and P40.03
start from the starting frequency?
Y
Set P11.00=0
N
DC braking firstly and start from the starting frequency?
Y
set P11.00=1, set DC brake current P11.03 and brake holding time P11.04
Set start to keep frequency P11.01 and start frequency keep-time P11.02
N
Speed tracking start, Set P11.00=2
decelerate to stop?
Y
Set P12.00=1
N
free stop?
Y
Set P12.00=0
N
DC brake stop, set P12.00=2, correctly set P12.03-P12.05 (refer to Chapter 7 "Parameter Details" for its meaning)
DC brake +deceleration to stop?
Y
DC brake stop, set P12.00=2, correctly set P12.03-P12.05 (refer to Chapter 7 "Parameter Details" for its meaning)
N
deceleration + keep excitation, set P12.00=3
set stop holding frequency P12.01 and stop frequency holding time P12.02
anti-reverse?
Set P71.05=1
Y
N
set P71.05=1
dynamic braking?
Y
Set P13.00=1
N
set P13.000=0
end.

## 5.6 Operation Example

In the following example, stop display parameter is the setting frequency, which is 50.00Hz at factory. Those underlined are the current editing bit. Set the setting frequency, for example, P40.00 = 25.00Hz.




## 5.7 Fault Display

When inverter has fault, fault indicator D4 on top of operator will blink. LED tube light will display real-time fault code. Table 5-5 lists fault codes and names.

**Table 5-5 Table of fault code & name**

| Fault code | Fault description | Fault code | Fault description |
|---|---|---|---|
| 1 | Module overcurrent protection | 2 | ADC fault |
| 3 | Heatsink overheat | 4 | Brake unit fault |
| 5 | Fuse break fault | 6 | Output torque overload |
| 7 | Speed deviation | 8 | DC bus over-voltage protection |
| 9 | DC bus under-voltage | 10 | Output phase loss |
| 11 | Motor overcurrent at low speed | 12 | Encoder fault |
| 13 | Current detected while stop | 14 | Speed reversed direction in running |
| 15 | Speed detected while stop | 16 | Wrong motor phase |
| 17 | Overspeed in the same direction | 18 | Overspeed in the opposite direction |
| 19 | Wrong phase sequence of UVW encoder | 20 | Encoder communication fault |
| 21 | abc overcurrent | 22 | Brake detection trouble |
| 23 | Input overvoltage | 24 | UVW encoder disconnected |
| 25 | Spare | 26 | Encoder haven't self-learned |
| 27 | Output overcurrent | 28 | SIN/COS encoder fault |
| 29 | Input phase loss | 30 | Overspeed protection |
| 31 | Motor high speed overcurrent | 32 | Ground protection |
| 33 | Aging capacitor | 34 | External fault |
| 35 | Output unbalance | 36 | Wrong parameter setting |
| 37 | Current sensor fault | 38 | Braking resistor short circuit |
| 39 | Too large instant current | 40 | Faulty output contactor |

| Fault code | Fault description | Fault code | Fault description |
|---|---|---|---|
| 41 | Brake detection fault | 42 | IGBT short fault |
| 43 | Communication fault | 44 | Abnormal input power |
| 47 | Abnormal analog input | 48 | Disconnected temperature sampling |
| 49 | PT detection fault | 50 | Humidity fault |
| 51 | Abnormal running output current | 52 | PTC high temperature alarm |

# Chapter 6 Functional Parameter Table

## 6.1 Introduction to Function Code Parameters Table

| Simple table field | Description |
|---|---|
| Function code symbol | Function code symbol, for example P00.00 |
| Function code name | Name of function code, to explain its roles |
| Factory default | Function code set value after reset to factory default operation (see P00.01) |
| Setting range | The minimum and maximum value set permitted by function code |
| Unit | V: voltage; A: current; ℃: degree; Ω: ohm,; mH: millihenry rpm: rotating speed %: percentage; bps: baud rate; Hz, kHz: frequency; ms, s, min, h, kh: time; kW: power; /: no unit, etc |
| Properties | ○: modifiable during running; ×: modifiable only during stop; *: read-only parameter, unchangeable |
| Function code option | List of function code parameter setting |
| User setting | Parameter record by the user |

## 6.2 Simple Table of Function Code Parameters

### 6.2.1 Group P0X User Parameters

| Group P00 Password Parameter | | | | | | |
|---|---|---|---|---|---|---|
| **Function code** | **Function code name** | **Factory default** | **Setting range** | **Unit** | **Properties** | **Option description** |
| P00.00 | Login password | 0 | 0～65535 | / | × | 0: no password; other: login password; |
| P00.01 | Modify password | 0 | 0～65535 | / | × | 0: no password; other: password protection; |
| P00.02 | Reserved password | 0 | 0～65535 | / | × | Reserved |
| **Group P01 Customer parameter** | | | | | | |
| **Group P02 Special functional parameter** | | | | | | |

### 6.2.2 Group P1X Control Parameters

6.2.2.1 Group P10 Basic Control Parameters

| Function code | Function code name | Factory default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P10.00 | Control mode selection | 0 | 0～5 | / | × | 0: Voltage vector V/f control<br>1: Vector control 2 without speed sensor<br>2: Torque control with speed sensor<br>3: Vector control with speed sensor<br>4: Spare<br>5: Vector control 1 without speed sensor |
| P10.01 | Operating mode selection | 0 | 0～3 | / | × | 0: 2-wire 1; 1: 2-wire 2;<br>2: 3-wire 1; 3: 3-wire 2; |
| P10.02 | Run command given mode selection | 0 | 0～4 | / | × | 0: panel 1: terminal<br>2: communication (Modbus)<br>3: CAN given<br>4: Profibus_DP given |
| P10.03 | Frequency/speed given mode 1 | 0 | 0～16 | / | × | 0: given ▲ and ▼ for panel frequency<br>1: digital multi-speed given target speed<br>2: spare<br>3: analog 0 given target speed<br>4: analog 0 given current speed<br>5: analog 1 given target speed o<br>6: analog 1 given current speed<br>7: communication (Modbus) given current speed<br>8: PID given target speed<br>9: reserved<br>10: reserved<br>11: reserved<br>12: communication (Modbus) given target speed<br>13: CAN given current speed |

| Function code | Function code name | Factory default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| | | | | | | 14: CAN given target speed |
| | | | | | | 15: Up/Down given speed |
| | | | | | | 16: Profibus_DP given speed |
| P10.04 | Torque given mode | 0 | 0～6 | / | × | 0: panel given torque |
| | | | | | | 1: analog 0 given target torque |
| | | | | | | 2: analog 1 given target torque |
| | | | | | | 3: communication given torque |
| | | | | | | 4: function given target torque |
| | | | | | | 5: ModBus given torque |
| | | | | | | 6: Profibus-DP given torque |
| P10.05 | Compensating torque given mode | 0 | 0～6 | / | × | 0: no compensating torque |
| | | | | | | 1: digital compensating torque |
| | | | | | | 2: analog 0 given compensating torque |
| | | | | | | 3: analog 1 given compensating torque |
| | | | | | | 4: communication given compensating torque |
| | | | | | | 5: automatic compensating torque |
| | | | | | | 6: Profibus-DP compensating torque |
| P10.06 | Speed limit selection | 0 | 0～5 | / | × | 0: internal parameter limit |
| | | | | | | 1: analog 0 limit |
| | | | | | | 2: analog 1 limit |
| | | | | | | 3: analog 2 limit |
| | | | | | | 4: ModBus communication limit |
| | | | | | | 5: automatic limit |
| P10.07 | Frequency/speed given mode 2 | 0 | 0～16 | / | × | As P10.03 |

6.2.2.2 Group P11 Starting Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P11.00 | Starting mode | 0 | 0～2 | / | × | 0: normal start<br>1: restart after DC braking<br>2: speed track start |
| P11.01 | Start holding frequency | 0.00 | 0.00～30.00 | Hz | × | |
| P11.02 | Holding time of starting frequency | 0.0 | 0.0～3600.0 | s | × | |
| P11.03 | Starting DC injection current | 30.0 | 0.0～120.0 | % | × | |
| P11.04 | Starting DC injection time | 5.0 | 0.0～99.9 | s | × | |
| P11.05 | Excitation time | 0.0 | 0.0～99.9 | s | × | |
| P11.06 | Zero servo time | 0.0 | 0.0～99.9 | s | × | |
| P11.07 | Brake actuation time | 0.20 | 0.00～99.99 | s | × | |
| P11.08 | Track delay time | 1000 | 0～65535 | ms | × | |
| P11.09 | Track zero voltage time | 100 | 0.0～65535 | ms | × | |
| P11.10 | Tracking voltage Kp | 0.20 | 0.00～6553.50 | / | × | |
| P11.11 | Tracking voltage Ki | 0.30 | 0.00～6553.50 | / | × | |
| P11.12 | Tracking voltage Kd | 0.00 | 0.00～6553.50 | / | × | |
| P11.13 | Track exit delay | 1000 | 0～65535 | ms | × | |
| P11.14 | Maximum current during track | 100.0 | 0～200.0 | % | × | |
| P11.15 | Tracking frequency change gain | 10.0 | 0～100.0 | % | × | |
| P11.16 | Maximum voltage during track | 0 | 0～65535 | V | × | |
| P11.17 | Initial tracking frequency | 50.00 | 0.00～100.00 | Hz | × | |
| P11.18 | Maximum current during track | 0.0 | 0～6553.5 | A | × | |
| P11.19 | Reverse breaking current | 20.0 | 0.0～100.0 | % | × | |

6.2.2.3 Group P12 Parking Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P12.00 | Parking mode | 0 | 0～4 | / | × | 0: inertia parking<br>1: decelerate parking<br>2: deceleration + DC braking<br>3: deceleration + holding excitation<br>4: deceleration+ holding torque |
| P12.01 | Parking holding frequency | 0.00 | 0.00～300.00 | Hz | × | |
| P12.02 | Parking frequency holding time | 0.0 | 0.0～99.9 | s | × | |
| P12.03 | DCbraking initial frequency | 2.50 | 0.00～10.00 | Hz | × | |
| P12.04 | Parking DC braking current | 50．0 | 0.0～100.0 | % | × | |
| P12.05 | Parking DC braking time | 0.5 | 0～10.0 | s | × | |
| P12.06 | Parking excitation holding time | 0 | 0～65535 | s | × | |

6.2.2.4 Group P13 Braking Function Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P13.00 | Dynamic braking selection | 1 | 0～1 | / | × | 0: turn on dynamic braking<br>1: not turn on dynamic braking<br>Built-in braking unit, default 0 |
| P13.01 | Braking turning-on voltage | 660 | 620～750 | V | × | |
| P13.02 | Braking unit service time | 60.0 | 0.0～300.0 | s | × | |

6.2.2.5 Group P14 V/F Control Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P14.00 | V/F curve setting | 0 | 0～4 | / | × | 0: standard V/F straight line; |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| | | | | | | 1: 1.2-power curve |
| | | | | | | 2: 1.5-power curve |
| | | | | | | 3: second power curve |
| | | | | | | 4: user defined |
| P14.01 | V/F voltage value V0 | 76 | 0.0～460.0 | V | × | |
| P14.02 | V/F frequency value F0 | 10.00 | 0.00～300.00 | Hz | × | F0<F1 |
| P14.03 | V/F voltage value V1 | 152 | 0.0～460.0 | V | × | |
| P14.04 | V/F frequency value F1 | 20.00 | 0.00～300.00 | Hz | × | F1<F2 |
| P14.05 | V/F voltage value V2 | 228 | 0.0～460.0 | V | × | |
| P14.06 | V/F frequency value F2 | 30.00 | 0.00～300.00 | Hz | × | F2<F3 |
| P14.07 | V/F voltage value V3 | 304 | 0.0～460.0 | V | × | |
| P14.08 | V/F frequency value F3 | 40.00 | 0.00～300.00 | Hz | × | F3<F4 |
| P14.09 | V/F voltage value V4 | 380 | 0.0～460.0 | V | × | |
| P14.10 | V/F frequency value F4 | 50.00 | 0.00～300.00 | Hz | × | |



## 6.2.3 Group P2X Motor Parameters

6.2.3.1 P20 Basic Motor Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P20.00 | Type of motor 1 | 0 | 0 | / | | 0: asynchronous |
| P20.01 | Rated power of motor 1 | As per the inverter power | 0～655.35 | kW | × | Set as per the motor nameplate |
| P20.02 | Rated current of motor 1 | As per the inverter current | 0.1～999.9 | A | × | Set as per the motor nameplate |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P20.03 | Rated frequency of motor 1 | 50.00 | 0.00～300.00 | Hz | × | Set as per the motor nameplate |
| P20.04 | Rated speed of motor 1 | 1460 | 0～30000 | rpm | × | Set as per the motor nameplate |
| P20.05 | Rated voltage of motor 1 | 380 | 0～460 | V | × | Set as per the motor nameplate |
| P20.06 | Number of poles of motor 1 | 4 | 2～128 | / | × | Number of pole-pair of motor=poles/2 |
| P20.07 | Rated slip frequency of motor 1 | 1.40 | 0.10～655.35 | Hz | × | Set as per the motor nameplate |
| P20.08 | Maximum slip frequency of motor 1 | 2.80 | 0.10～655.35 | Hz | × | |
| P20.09 | Phase sequence of motor 1 | 1 | 0～1 | / | × | 0: negative phase sequence;<br>1: positive phase sequence |
| P20.10 | No-load current coefficient of motor 1 | 30.00 | 0.10～60.00 | % | × | |
| P20.11 | Motor rated torque | 450.0 | 0.0～6553.5 | Nm | × | Set as per the motor nameplate |
| P20.12 | Maximum power factor of motor 1 | 250 | 50～400 | % | × | |
| P20.13 | Maximum power of motor 1 | 50.00 | 0.00～300.00 | Hz | × | |
| P20.14 | Type of motor 2 | 0 | 0 | / | | 0: asynchronous |
| P20.15 | Rated power of motor 2 | As per the inverter power | 0～655.35 | kW | × | Set as per the motor nameplate |
| P20.16 | Rated current of motor 2 | As per the inverter current | 0.1～999.9 | A | × | Set as per the motor nameplate |
| P20.17 | Rated frequency of motor 2 | 50.00 | 0.00～300.00 | Hz | × | Set as per the motor nameplate |
| P20.18 | Rated speed of motor 2 | 1460 | 0～30000 | rpm | × | Set as per the motor nameplate |
| P20.19 | Rated voltage of motor 2 | 380 | 0～460 | V | × | Set as per the motor nameplate |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P20.20 | Number of poles of motor 2 | 4 | 2～128 | / | × | Number of pole-pair of motor=poles/2 |
| P20.21 | Rated slip frequency of motor 2 | 1.40 | 0.10～655.35 | Hz | × | Set as per the motor nameplate |
| P20.22 | Maximum slip frequency of motor 2 | 2.80 | 0.10～655.35 | Hz | × | |
| P20.23 | Phase sequence of motor 2 | 1 | 0～1 | / | × | 0: negative phase sequence;<br>1: positive phase sequence |
| P20.24 | No-load current coefficient of motor 2 | 30.00 | 0.00～60.00 | % | × | |
| P20.25 | Maximum power factor of motor 2 | 450.0 | 0.0～6553.5 | % | × | |
| P20.26 | Maximum frequency of motor 2 | 250 | 50～400 | Hz | × | |

**Note 1: different inverter power corresponds to different default value.**

6.2.3.2 P21 Advanced Motor Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P21.00 | Motor tuning | 0 | 0～7 | / | × | 0: normal operation<br>1: encoder static self-learning<br>2: encoder self-learning correction<br>3: encoder self-learning end<br>4: motor static self-learning<br>5: motor dynamic self-learning<br>6: motor static advanced self-learning<br>7: motor dynamic self-learning |
| P21.01 | Stator resistance of motor 1 | 0.072 | 0.000～65.000 | Ω | × | |
| P21.02 | Rotor resistance of motor 1 | 0.054 | 0.000～65.000 | Ω | × | |
| P21.03 | Stator inductance of motor 1 | 0.0221 | 0.0000～6.0000 | H | × | |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P21.04 | Rotor inductance of motor 1 | 0.0221 | 0.0000 ～ 6.0000 | H | × | |
| P21.05 | Mutual inductance of motor 1 | 0.0210 | 0.0000 ～ 6.0000 | H | × | |
| P21.06 | Stator resistance of motor 2 | 0.072 | 0.000～ 65.000 | Ω | × | |
| P21.07 | Rotor resistance of motor 2 | 0.054 | 0.000～ 65.000 | Ω | × | |
| P21.08 | Stator inductance of motor 2 | 0.0221 | 0.0000 ～ 6.0000 | H | × | |
| P21.09 | Rotor inductance of motor 2 | 0.0221 | 0.0000 ～ 6.0000 | H | × | |
| P21.10 | Mutual inductance of motor 2 | 0.0210 | 0.0000 ～ 6.0000 | H | × | |

6.2.3.3 P22 Auxiliary Motor Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P22.00 | Motor rotary inertia | 20 | 0～ | kgm^2 | × | Rotary inertia |
| P22.01 | Encoder type | 0 | 0～3 | / | × | 0: incremental;<br>1: SinCos;<br>2: EnDat;<br>3: Rezav |
| P22.02 | Encoder 1 pulses | 1024 | 500～ 16000 | ppr | × | Encoder pulses |
| P22.03 | Encoder frequency division coefficient | 0 | 0～7 | / | × | Encoder frequency division coefficient |
| P22.04 | Encoder 1 position angle | 0.0 | 0.0～ 360.0 | rad | * | Encoder position angle |
| P22.05 | Encoder feedback speed filter time constant | 5 | 0～ 1000 | ms | × | |
| P22.06 | Encoder 1 direction | 1 | 0～1 | / | × | 0: negative phase sequence<br>1: positive phase sequence |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P22.07 | SinCos encoder subdivision coefficient | 11 | 7,9,11 | / | × | 7—128 ;<br>9-512 ;<br>11-2048 |
| P22.08 | Poles of Rezav encoder 1 | 2 | 2~128 | P | × | |
| P22.09 | Type of encoder 2 | 0 | 0~3 | / | × | 0: incremental; 1: SinCos;<br>2: EnDat; 3: Rezav |
| P22.10 | Pulses of encoder 2 | 1024 | 500～16000 | ppr | × | Encoder pulses |
| P22.11 | Encoder 2 position angle | 0.0 | 0.0～360.0 | rad | * | Encoder position angle |
| P22.12 | Encoder 2 direction | 1 | 0～1 | / | × | 0: negative phase sequence,<br>1: positive phase sequence |
| P22.13 | Poles of Rezav encoder 2 | 2 | 2~128 | P | × | |

6.2.3.4 P23 Motor Protection Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P23.00 | Motor overheat protection selection | 0 | 0～2 | / | × | 0: no protection<br>1: input via analog A0<br>2: input via analog A1 |
| P23.01 | Motor sensor protection threshold value | 5.000 | 0.000～10.000 | V | × | 0.00～10.00V |
| P23.02 | Motor overcurrent protection time | 60.0 | 0.5～300.0 | s | × | |
| P23.03 | Motor low speed overcurrent threshold value | 150.00 | 0.00～150.00 | % | × | 20% rated speed and below |
| P23.04 | Motor low speed overcurrent time | 60.0 | 0.1～120.0 | s | × | |
| P23.05 | Motor high speed overcurrent threshold value | 120.00 | 0.00～150.0 | % | × | 20% rated speed and above |
| P23.06 | Motor high speed overcurrent time | 30.0 | 0.1～60.0 | s | × | |

## 6.2.4 Group P3X Digital Parameters

### 6.2.4.1 P30 Digital Input Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P30.00 | Input function selection of terminal X0 | 7 | 0～63 | / | × | Refer to Chapter 7 “Parameter Details”. |
| P30.01 | Input function selection of terminal X1 | 8 | 0～63 | / | × | |
| P30.02 | Input function selection of terminal X2 | 0 | 0～63 | / | × | |
| P30.03 | Input function selection of terminal X3 | 0 | 0～63 | / | × | |
| P30.04 | Input function selection of terminal X4 | 0 | 0～63 | / | × | |
| P30.05 | Input function selection of terminal X5 | 0 | 0～63 | / | × | |
| P30.06 | Input function selection of terminal X6 | 0 | 0～63 | / | × | |
| P30.07 | Input function selection of terminals P1-P2 | 1 | 0~1 | / | × | |
| P30.08 | Input filter times of X0 ~ X6 and P1-P2 | 5 | 0～100 | per | × | Default high level, which is reduced with over temperature signal |

### 6.2.4.2 P31 Digital Output Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P31.00 | Output K1 function definition | 2 | 0～63 | / | × | Refer to Chapter 7 “Definition table of multifunctional output terminals in group P31 |
| P31.01 | Output K2 function definition | 25 | 0～63 | / | × | |
| P31.02 | Output K3 function definition | 0 | 0～63 | / | × | |
| P31.03 | Output K4 function | 0 | 0～63 | / | × | |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| | definition | | | | | |
| P31.04 | Terminal Y0 output function definition | 0 | 0～63 | / | × | |
| P31.05 | Terminal Y1 output function definition | 0 | 0～63 | / | × | |
| P31.06 | Relay K1 terminal action relay | 0.0 | 0.0～60.0 | s | × | |
| P31.07 | Relay K1 terminal reset relay | 0.0 | 0.0～60.0 | s | × | |
| P31.08 | Relay K2 terminal action relay | 0.0 | 0.0～60.0 | s | × | |
| P31.09 | Relay K2 terminal reset relay | 0.0 | 0.0～60.0 | s | × | |
| P31.10 | Relay K3 terminal action relay | 0.0 | 0.0～60.0 | s | × | |
| P31.11 | Relay K3 terminal reset relay | 0.0 | 0.0～60.0 | s | × | |
| P31.12 | Relay K4 terminal action relay | 0.0 | 0.0～60.0 | s | × | |
| P31.13 | Relay K4 terminal reset relay | 0.0 | 0.0～60.0 | s | × | |
| P31.14 | Terminal Y0 action delay | 0.0 | 0.0～60.0 | s | × | |
| P31.15 | Terminal Y0 reset delay | 0.0 | 0.0～60.0 | s | × | |
| P31.16 | Terminal Y1 action delay | 0.0 | 0.0～60.0 | s | × | |
| P31.17 | Terminal Y1 reset delay | 0.0 | 0.0～60.0 | s | × | |
| P31.20 | Non zero current detection width | 4.0 | 0.0～50.0 | % | × | |
| P31.21 | Frequency arrive detection width | 1.00 | 0.0～300.00 | Hz | × | |
| P31.22 | Detection frequency | 1.00 | 0.00～300.00 | Hz | × | For frequency detection function |
| P31.23 | Detection frequency width | 0.20 | 0.00～300.00 | Hz | × | For frequency detection function |
| P31.24 | Single run time arrive | 2 | 0~65535 | h | × | |
| P31.25 | Accumulated run time arrive | 8 | 0~65535 | h | × | |

6.2.4.3 P32 Analog Input Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P32.00 | A0 input type | 1 | 0～3 | / | × | 0: 0V ~ 10V<br>1: -10V ~ 10V<br>2: 0 ~ 20mA<br>3: 4 ~ 20mA<br>Note: it depends on I/O board type. |
| P32.01 | A0 input function selection | 0 | 0～6 | / | × | 0: no function<br>1: target speed signal<br>2: current speed signal<br>3: torque signal<br>4: compensating torque signal<br>5: speed limit signal<br>6: PTC temperature signal |
| P32.02 | A0 offset | 10.000 | 0.000～20.000 | V | × | Voltage type:<br>0.000 offset-10.000V<br>10.000 offset 0V<br>20.000 offset +10V |
| P32.03 | A0 gain | 100.0 | 0.1～1000.0 | % | × | Factor of proportionality, typical 100% |
| P32.04 | A0 filtering time | 10 | 0～65535 | ms | × | When PTC temperature signal is chosen, default 2000ms |
| P32.05 | A0 amplitude limit | 10.000 | 0.000～10.000 | V/mA | × | It is set as 20.000mA, if current type input is chosen. |
| P32.06 | A1 input type | 1 | 0～3 | / | × | 0: 0V ~ 10V<br>1: -10V ~ 10V<br>2: 0 ~ 20mA<br>3: 4 ~ 20mA<br>Note: it depends on IO board type. |
| P32.07 | A1 input function selection | 0 | 0～6 | / | × | As A0 |
| P32.08 | A1 offset | 10.000 | 0.000～20.000 | V | × | |
| P32.09 | A1 gain | 100.0 | 0.1～1000.0 | % | × | |
| P32.10 | A1 filtering time | 10 | 0～65535 | ms | × | When PTC temperature signal is chosen, default 2000ms. |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P32.11 | A1 amplitude limit | 10.000 | 0.000～10.000 | V/mA | × | It is set as 20.000mA, if current type input is chosen. |

6.2.4.4 P33 Analog Output Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P33.00 | M0 output function selection | 1 | 0～16 | / | × | Refer to chapter 7 “Parameter details |
| P33.01 | M0 offset | 15.000 | 0.000～20.000 | V | × | |
| P33.02 | M0 gain | 100.0 | 0.1～6000.0 | % | × | |
| P33.03 | M1 output function selection | 2 | 0～16 | / | × | Refer to chapter 7 “Parameter details |
| P33.04 | M1 offset | 15.000 | 0.000～20.000 | V | × | |
| P33.05 | M1 gain | 100.0 | 0.1～6000.0 | % | × | |
| P33.06 | M0 output type | 0 | 0~4 | / | × | 1：0～10V<br>2：-10V～+10V<br>3：0～20mA<br>4:4～20mA |
| P33.07 | M1 output type | 0 | 0~4 | / | × | 1：0～10V<br>2：-10V～+10V<br>3：0～20mA<br>4:4～20mA |

## 6.2.5 Group P4X Speed Control Parameters

6.2.5.1 P40 Basic Speed Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P40.00 | Panel speed | 5.00 | 0.0～300.00 | Hz | × | |
| P40.01 | Basic frequency | 50.00 | 0.0～300.00 | Hz | × | |
| P40.02 | Acceleration time 0 | 5.00 | 0.1～360.00 | s | × | The greater power, the longer default acceleration time |
| P40.03 | Deceleration time 0 | 5.00 | 0.1～360.00 | s | × | |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P40.04 | Acceleration time 1 | 5.00 | 0.1～360.00 | s | × | |
| P40.05 | Deceleration time 1 | 5.00 | 0.1～360.00 | s | × | |
| P40.06 | Acceleration time 2 | 5.00 | 0.1～360.00 | s | × | |
| P40.07 | Deceleration time 2 | 5.00 | 0.1～360.00 | s | × | |
| P40.08 | Acceleration time 3 | 5.00 | 0.1～360.00 | s | × | |
| P40.09 | Deceleration time 3 | 5.00 | 0.1～360.00 | s | × | |
| P40.10 | Acceleration circular arc Ts0 | 0.00 | 0.00～10.00 | s | × | Start to accelerate |
| P40.11 | Acceleration circular arc Ts1 | 0.00 | 0.00～10.00 | s | × | Stop accelerating |
| P40.12 | Deceleration circular arc Ts2 | 0.00 | 0.00～10.00 | s | × | Start to decelerate |
| P40.13 | Deceleration circular arc Ts3 | 0.00 | 0.00～10.00 | s | × | Stop decelerating |

6.2.5.2 P41 Digital Multi-speed Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P41.00 | Digital multi-speed given 0 | 0.00 | 0.00～300.00 | Hz | × | |
| P41.01 | Digital multi-speed given 1 | 5.00 | 0.00～300.00 | Hz | × | |
| P41.02 | Digital multi-speed given 2 | 10.00 | 0.00～300.00 | Hz | × | |
| P41.03 | Digital multi-speed given 3 | 20.00 | 0.00～300.00 | Hz | × | |
| P41.04 | Digital multi-speed given 4 | 30.00 | 0.00～300.00 | Hz | × | |
| P41.05 | Digital multi-speed given 5 | 40.00 | 0.00～300.00 | Hz | × | |
| P41.06 | Digital multi-speed given 6 | 50.00 | 0.00～300.00 | Hz | × | |
| P41.07 | Digital multi-speed given 7 | 60.00 | 0.00～300.00 | Hz | × | |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P41.08 | Digital multi-speed given 8 | 0.00 | 0.00～300.00 | Hz | × | |
| P41.09 | Digital multi-speed given 9 | 0.00 | 0.00～300.00 | Hz | × | |
| P41.10 | Digital multi-speed given 10 | 0.00 | 0.00～300.00 | Hz | × | |
| P41.11 | Digital multi-speed given 11 | 0.00 | 0.00～300.00 | Hz | × | |
| P41.12 | Digital multi-speed given 12 | 0.00 | 0.00～300.00 | Hz | × | |
| P41.13 | Digital multi-speed given 13 | 0.00 | 0.00～300.00 | Hz | × | |
| P41.14 | Digital multi-speed given 14 | 0.00 | 0.00～300.00 | Hz | × | |
| P41.15 | Digital multi-speed given 15 | 0.00 | 0.00～300.00 | Hz | × | |
| P41.16 | Inching frequency given | 5.00 | 0.00～50.00 | Hz | × | |

## 6.2.6 Group P5X Process Control Parameters

6.2.6.1 Group P50 Process Open Loop Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P50.00 | Open loop auxiliary given mode | 0 | 0～5 | / | × | 0: no; 1: A0; 2: A1;<br>3: spare 4: spare<br>5: PID given target speed |
| P50.01 | Open loop given main and auxiliary relationship calculation | 0 | 0～6 | / | × | 0: no calculation<br>1: main+auxiliary<br>2: main-auxiliary<br>3: spare<br>4: spare<br>5: take the maximum value<br>6: take the minimum value |

6.2.6.2 P51 Process Closed Loop Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P51.00 | Closed loop control selection | 0 | 0～1 | / | × | 0: invalid closed loop run control<br>1: effective closed loop run |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| | | | | | | control |
| P51.01 | Closed loop control main given mode | 0 | 0～6 | / | × | 0: internal given<br>1: A0 2: A1<br>3: spare 4: spare<br>5: spare<br>6: Modbus communication given |
| P51.02 | Closed loop control auxiliary given mode | 2 | 0～6 | / | × | 0: no<br>1: A0<br>2: A1 3: spare<br>4: spare<br>5: spare<br>6: Modbus communication given |
| P51.03 | Closed loop control auxiliary given calculation | 0 | 0～6 | / | × | 0: no calculatiojn<br>1: main+auxiliary<br>2: main-auxiliary<br>3: spare<br>4: spare<br>5: take the maximum value<br>6: take the minimum value |
| P51.04 | Closed loop control main feedback mode | 1 | 0～6 | / | × | 0: no<br>1: A0<br>2: A1<br>3: spare<br>4: spare<br>5: multi-voltage given<br>6: Modbus communication given |
| P51.05 | Closed loop control auxiliary feedback mode | 2 | 0～6 | / | × | 0: no<br>1: A0<br>2: A1<br>3: spare<br>4: spare<br>5: spare<br>6: Modbus communication given |
| P51.06 | Closed loop control feedback main and auxiliary calculation | 0 | 0～6 | / | × | 0: no calculation<br>1: main+auxiliary<br>2: main-auxiliary<br>3: spare |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| | | | | | | 4: spare<br>5: take the maximum value<br>6: take the minimum value |
| P51.07 | PID internal given value | 0.70 | 0.00～10.00 | | ○ | The unit depends on P51.08 |
| P51.08 | Unit | 0 | 0～3 | / | × | Unit 0: V 1: % 2: Mpa 3: degree |
| P51.09 | Proportional gain Kp | 0.50 | 0.00～10.00 | / | ○ | |
| P51.10 | Integral gain Ki | 0.50 | 0.00～10.00 | / | ○ | |
| P51.11 | Differential gain Kd | 0.00 | 0.00～10.00 | / | ○ | |
| P51.12 | Spare | 0 | × | × | × | |
| P51.13 | Integral mode selection | 0 | 0～1 | / | × | 0: Stop integral regulation when the frequency reaches the upper and lower limit<br>1: Continue integral regulation when the frequency reaches the upper and lower limit |
| P51.14 | Spare | 0 | × | × | × | |
| P51.15 | Spare | 0 | × | × | × | |
| P51.16 | Spare | 0 | × | × | × | |
| P51.17 | Spare | 0 | × | × | × | |
| P51.18 | Spare | 0 | × | × | × | |
| P51.19 | Spare | 0 | × | × | × | |
| P51.20 | Spare | 0 | × | × | × | |
| P51.21 | Spare | 0 | × | × | × | |
| P51.22 | Integral action upper limit | 100.00 | 0.00～ | % | × | |
| P51.23 | Spare | 0 | × | × | × | |
| P51.24 | Closed loop input upper limit | 50.0 | 0.00～ | % | × | |
| P51.25 | closed loop input lower limit | 0.0 | 0.0～20.0 | % | × | |
| P51.26 | Closed loop output upper limit | 100.0 | 0.00～ | % | × | |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P51.27 | Spare | 0 | × | × | × | |
| P51.28 | Dormancy selection | 0 | 0～ 1 | / | × | 0:N<br>1:Y |
| P51.29 | Dormancy frequency | 30.00 | 0.00～ 50.00 | Hz | × | P51.28=1 valid |
| P51.30 | Dormancy delay | 10.0 | 0～ 655.35 | S | × | P51.28=1 valid |
| P51.31 | Awake deviation | 0.10 | 0.0～ 100.0 | % | × | P51.2=1 valid, |
| P51.32 | Awake delay | 10.0 | 0.0～ 3600.0 | s | × | |
| P51.33 | Given acceleration time | 0.0 | 0.0～ 50.0 | s | × | |
| P51.34 | Closed loop output filtering time | 0.01 | 0.00～ 50.000 | S | × | |
| P51.35 | Given quantity lower limit | 0.00 | 0.00～ 100.00 | V | × | The unit depends on P51.08 |
| P51.36 | Feedback quantity range lower limit | 0.00 | 0.00～ 100.00 | V | × | The unit depends on P51.08 |
| P51.37 | Given quantity upper limit | 10.00 | 0.00～ 100.00 | V | × | The unit depends on P51.08 |
| P51.38 | Feedback quantity range upper limit | 10.00 | 0.00～ 100.00 | V | × | The unit depends on P51.08 |
| P51.39 | Preset frequency | 22.0 | 0.0～ Max.Frequency | Hz | × | |
| P51.40 | Preset frequency holding time | 0 | 0～60 | s | × | |
| P51.41 | Positive and negative characteristics | 0 | 0～1 | / | × | 0: positive characteristic<br>1: negative characteristic |

## 6.2.7 Group P6X Vector Control Parameters

6.2.7.1 Group P60 Speed Loop Control Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P60.00 | Speed loop - zero speed P | 0.00 | 0.00～ 655.35 | / | × | Zero servo section |
| P60.01 | Speed loop - zero speed I | 0.00 | 0.00～ 655.35 | / | × | |
| P60.02 | Speed loop - zero | 0.00 | 0.00～ | / | × | |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| | speed D | | 655.35 | | | |
| P60.03 | Speed loop - low speed P | 100.00 | 0.00～655.35 | / | × | Low speed section |
| P60.04 | Speed loop - low speed I | 5.00 | 0.00～655.35 | / | × | |
| P60.05 | Speed loop - low speed D | 0.50 | 0.00～655.35 | / | × | |
| P60.06 | Speed loop - medium speed P | 70.00 | 0.00～655.35 | / | × | Medium speed section |
| P60.07 | Speed loop - medium speed I | 2.00 | 0.00～655.35 | / | × | |
| P60.08 | Speed loop - medium speed D | 0.20 | 0.00～655.35 | / | × | |
| P60.09 | Speed loop - high speed P | 70.00 | 0.00～655.35 | / | × | High speed section |
| P60.10 | Speed loop - high speed I | 2.00 | 0.00～655.35 | / | × | |
| P60.11 | Speed loop - high speed D | 0.10 | 0.00～655.35 | / | × | |
| P60.12 | Switching frequency 0 | 10.0 | 0.00～655.35 | % | × | |
| P60.13 | Switching frequency 1 | 60.0 | 0.00～655.35 | % | × | |

6.2.7.2 Group P61 Current Control Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P61.00 | Current loop Kp | 1.40 | 0.01～9.99 | / | × | |
| P61.01 | Current loop Ki | 1.00 | 0.01～9.99 | / | × | |
| P61.02 | Current loop Kd | 0.00 | 0.00～9.99 | / | × | |
| P61.03 | Current loop bandwidth | 400.0 | 0.1～1000.0 | Hz | × | |
| P61.04 | Magnetic link bandwidth | 0.8 | 0.01～1000.0 | Hz | × | |
| P61.05 | Current loop selection | 0 | 0～10 | / | × | |
| P61.06 | V/F control current loop Max | 1.0 | 0.0 ~100.0 | % | × | |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P61.07 | V/F control current loop Min | 1.0 | 0.0 ~100.0 | % | × | |

6.2.7.3 Group P62 Torque Control Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P62.00 | Digital torque given | 0.0 | 0.0～100.0 | % | × | |
| P62.01 | Torque direction | 0 | 0～1 | / | × | |
| P62.02 | Torque increase time | 1.00 | 0.01～655.35 | s | × | |
| P62.03 | Torque decrease time | 1.00 | 0.01～655.35 | s | × | |

6.2.7.4 P63 Torque Compensating Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P63.00 | Compensating torque direction | 0 | 0～1 | / | × | |
| P63.01 | Compensation gain | 100.0 | 0.0～200.0 | % | × | |
| P63.02 | Compensation offset | 0.0 | 0.0～100.0 | % | × | |
| P63.03 | Light load switch compensation | 0.0 | 0.0～99.9 | % | × | |
| P63.04 | Heavy load switch compensation | 0.0 | 0.0～99.9 | % | × | |

## 6.2.8 Group P7X Enhanced Control Parameters

6.2.8.1 P70 Limit and Protection Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P70.00 | Frequency upper limit | 50.00 | 0.01～Max.Frequency | Hz | × | 0.01～maximum frequency |
| P70.01 | Frequency lower limit | 0.00 | 0.01～Freq. upper limit | Hz | × | 0.01～frequency upper limit |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P70.02 | Maximum output frequency | 55.00 | 0.01～300.00 | Hz | × | 0.01～300.00 |
| P70.03 | Spare | 0 | × | × | × | |
| P70.04 | Output torque limit | 150 | 0～200 | % | × | |
| P70.05 | Inverter acceleration overcurrent threshold value | 160 | 0～200 | % | × | |
| P70.06 | Inverter deceleration overvoltage threshold value | 750 | 0～800 | V | × | |
| P70.07 | Overspeed protection coefficient | 120.00 | 0.00～ | % | × | |
| P70.08 | Special function selection | 16 | 0～65535 | / | × | |
| P70.10 | PT signal channel | 0 | 0～2 | / | × | 0: NC 1:A0 2:A1 |
| P70.11 | PT protection upper threshold value | 10.000 | 0.000～10.000 | V | × | |
| P70.12 | PT protection lower threshold value | 0.000 | 0.000～10.000 | V | × | |
| P70.13 | PT protection action delay | 3.0 | 0.0～10.0 | s | × | |
| P70.14 | HT signal channel | 0 | 0～2 | / | × | 0: NC 1:A0 2:A1 |
| P70.15 | HT protection upper threshold value | 10.000 | 0.000～10.000 | V | × | |
| P70.16 | HT protection lower threshold value | 0.000 | 0.000～10.000 | V | × | |
| P70.17 | HT protection action delay | 3.0 | 0.0～10.0 | s | × | |
| P70.18 | Bus undervoltage threshold value | 380 | 0～540 | V | × | |
| P70.19 | No-load up maximum torque | 0 | 0～400 | % | × | |
| P70.20 | No-load down maximum torque | 0 | 0～400 | % | × | |
| P70.21 | PWM detection delay | 800 | 0～65535 | ms | × | |
| P70.22 | Low MinFreq | 0 | 0～3 | | × | 0: run at the lower limit frequency<br>1: stop |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| | | | | | | 2: given frequency 0<br>3: inertia stop |

6.2.8.2 P71 Control Optimization Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P71.00 | Frequency hopping speed 1 | 0.00 | 0.00～100.00 | Hz | × | |
| P71.01 | Frequency hopping speed 2 | 0.00 | 0.00～100.00 | Hz | × | |
| P71.02 | Frequency hopping speed 3 | 0.00 | 0.00～100.00 | Hz | × | |
| P71.03 | Frequency hopping width | 0.00 | 0.00～100.00 | Hz | × | |
| P71.04 | Inertia compensation factor | 0.00 | 0.00～100.00 | % | × | |
| P71.05 | No reverse | 0 | 0～1 | / | × | 0：N<br>1：Y |
| P71.06 | Interval time for forward and reverse | 0.0 | 0.0～6553.5 | s | × | |
| P71.07 | PWM modulation mode | 2 | 0～2 | / | × | 0: 5-section;<br>1: 7-section;<br>2: <30%rpm 7-section, >30% 5-section |
| P71.08 | Automatic torque lifting | 83 | 0～1000 | / | × | 0: none<br>1: automatic torque lifting<br>2: suppression oscillation<br>4: slip compensation<br>8: stator resistance compensation<br>16: dead-time compensation<br>32: bus voltage compensation<br>64: suppression oscillation 2<br>(bit selection function) |
| P71.09 | V/F torque compensation | 0.0 | 0.0～30.0 | % | × | Manual torque lifting, P71.08=0 |
| P71.10 | V/F compensating maximum frequency | 10.0 | 0.0～50.0 | Hz | × | |
| P71.11 | Dead-time compensation mode | 0 | 0～2 | / | × | 0: compensate 100% as per angle;<br>1: compensate 50% as per |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| | | | | | | angle;<br>2: compensation as per current |
| P71.12 | Current slow down time | 0.00 | 0.01～655.35 | s | × | |
| P71.14 | Carrier frequency | 6.000 | 1.100～8.000 | KHz | × | |
| P71.15 | Random PWM width | 0.000 | 0.000～1.000 | KHz | × | |
| P71.16 | Regulator mode | 1 | 0～3 | / | × | |
| P71.17 | Contactor turning-on delay | 0.8 | 0.0～10.0 | s | × | |
| P71.18 | Open delay | 0.4 | 0.0～10.0 | s | × | |
| P71.19 | Contactor shutoff delay | 1.0 | 0.0～10.0 | s | × | |
| P71.20 | Brake delay | 0.1 | 0.0～10.0 | s | × | |
| P71.21 | Output shutoff delay | 0.3 | 0.0～10.0 | s | × | |
| P71.22 | Zero speed threshold value | 0.20 | 0.00～10.00 | Hz | × | |
| P71.23 | Forward dead-time compensation | 100 | 0～100 | % | × | |
| P71.24 | Reverse dead-time compensation | 100 | 0～100 | % | × | |
| P71.25 | Zero servo compensation | 0 | 0～100 | % | × | |
| P71.28 | Zero servo current loop gain factor | 100 | 50～200 | % | × | |
| P71.29 | PWM modulation selection | 0 | 0～1 | / | × | 0: underflow updating 1: overflow/underflow updating Set as 1 for the switching frequency below 4kHz |
| P71.33 | Speed precision adjustment | 100.0 | 0.0～100.0 | % | × | |
| P71.34 | Performance improving compensation | 106 | 0～1000 | / | × | |
| P71.35 | System inertia factor | 100.0 | 0.0～300.0 | % | × | |
| P71.36 | Automatic low speed | 100.0 | 0.0～ | % | × | |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| | torque lifting | | 300.0 | | | |
| P71.39 | Power failure detection threshold value | 480 | 380～550 | V | × | |
| P71.40 | KEB bus target voltage | 500 | 380～550 | V | × | |
| P71.41 | Power failure handling mode | 0 | 0～4 | / | × | 0: no handling<br>1: track start (time limit)<br>2: track start (time unlimited)<br>3: KEB (with detection undervoltage)<br>4: KEB (no detection undervoltage) |
| P71.42 | Maximum outage compensation time | 3.0 | 0.0～60.0 | s | × | |
| P71.43 | KEB shortest action time | 100 | 0～2000 | ms | × | |
| P71.44 | KEB initial frequency reduction quantity | 2.00 | 0.00～5.00 | ～ | × | |
| P71.45 | KEB deceleration time | 10.00 | 0.00～200.00 | s | 0.00～300.00 | |
| P71.46 | KEB deceleration mode | 0 | 0～3 | / | × | 0: variable deceleration<br>1: automatic deceleration<br>2: constant deceleration<br>3: constant deceleration (antistall) |
| P71.47 | KEB acceleration time | 25.00 | 0.00～300.00 | s | × | |
| P71.48 | KEB proportional Kp | 200.00 | 0.00～300.00 | / | × | |
| P71.49 | KEB integral Ki | 0.00 | 0.00～300.00 | / | × | |
| P71.50 | KEB differential Kd | 0.00 | 0.00～300.00 | / | × | |
| P71.51 | KEB integral upper limit | 100.0 | 0.0～300.00 | % | × | |
| P71.52 | KEB integral lower limit | 100.0 | 0.0～300.00 | % | × | |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P71.53 | KEB closed loop output upper limit | 100.0 | 0.0～300.00 | % | × | |
| P71.54 | KEB closed loop output lower limit | 100.0 | 0.0～300.00 | % | × | |
| P71.55 | KEB voltage deviation upper limit | 300.00 | 0.0～500.0 | V | × | |
| P71.56 | KEB voltage zero deviation value | 0.0 | 0.0～10.0 | V | × | |
| P71.57 | Variable carrier frequency threshold value | 0.00 | 0.00～50.00 | Hz | × | |
| P71.58 | Fan control selection | 0 | 0～4 | / | × | |
| P71.59 | Optimization parameter 1 | 0.0000 | | / | × | |
| P71.60 | Optimization parameter 2 | 100.0 | 1.0～300.0 | % | × | |
| P71.61 | Optimization parameter 3 | 100.0 | 1.0～300.0 | % | × | |
| P71.62 | UP/DOWN single step length | 0.10 | 0.00～10.00 | Hz | × | |

## 6.2.9 Group P8X Communication Parameters

6.2.9.1 Group P80 Communication Selection Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P80.00 | Communication mode selection | 0 | 0～3 | \ | × | 0：No communication<br>1：Profibus_DP；<br>2：Modbus；<br>3:Canbus |

6.2.9.2 Group P81 Modbus Communication Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P81.00 | Communication baud rate | 3 | 0～7 | bps | × | 0：1200 bps<br>1：2400 bps<br>2： 4800 bps<br>3： 9600 bps<br>4：19200 bps<br>5：38400 bps<br>6：57600 bps |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | 7：76800 bps |
| P81.01 | Data format | 0 | 0～2 | / | × | 0：1−8−1, None<br>1：1−8−1, ODD<br>2：1−8−1, EVEN |
| P81.02 | Transmission mode selection | 1 | 0～1 | / | × | 0：ASC;1：RTU |
| P81.04 | Local address | 1 | 1～247 | / | × | 1～247，0 is broadcast address |
| P81.05 | Communication status word set 1 | 0 | | / | × | |
| P81.06 | Communication status word set 2 | 0 | | / | × | |
| P81.07 | Communication address format selection | 1 | | / | × | 0: hexadecimal number system;<br>1: decimal number system |

6.2.9.3 Group P82 Profibus_DP Communication Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P82.00 | Local address | 0 | 0～255 | / | × | 0～255 |
| P82.01 | Big endian and little endian mode | 0 | 0～1 | / | × | See communication appendix B |
| P82.02 | User-defined status word set 1 | 16 | | | × | See communication appendix B |
| P82.03 | User-defined status word set 2 | 13 | | / | × | See communication appendix B |
| P82.04 | User-defined status word set 3 | 10 | | / | × | See communication appendix B |
| P82.05 | User-defined status word set 4 | 18 | | / | × | See communication appendix B |

## 6.2.10 Group P9X Fault and Display Parameters

6.2.10.1 Group P90 Language Selection Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P90.00 | Manipulator language selection | 0 | 0～1 | / | × | 0：Chinese<br>1：English |

6.2.10.2 Group P91 LCD Display Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P91.00 | U01 display data | 20 | 0～34 | / | × | Refer to Chapter 7 |
| P91.01 | U02 display data | 2 | 0～34 | / | × | |
| P91.02 | U03 display data | 3 | 0～34 | / | × | |
| P91.03 | U04 display data | 4 | 0～34 | / | × | |
| P91.04 | U05 display data | 6 | 0～34 | / | × | |
| P91.05 | U06 display data | 16 | 0～34 | / | × | Refer to Chapter 7 |
| P91.06 | U07 display data | 7 | 0～34 | / | × | |
| P91.07 | U08 display data | 5 | 0～34 | / | × | |
| P91.08 | U01 - U08 monitoring selection | 0 | 0～65535 | / | × | |

6.2.10.3 Group P92 LED Display Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P92.00 | LED display data | 2 | 0～34 | / | × | Refer to Chapter 7 |

6.2.10.4 Group P93 Running Record Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P93.00 | Inverter accumulated electrification time | 0 | 0～65535 | h | * | |
| P93.01 | Inverter accumulated running time | 0 | 0～65535 | h | * | |
| P93.02 | Radiator maximum temperature record | 0.0 | 0.0～100.0 | degree | * | |
| P93.03 | Accumulated output power | 0.0 | 0.0～999.9 | kWh | * | |
| P93.04 | Inverter output power | 0 | 0～65535 | MWh | * | |
| P93.05 | Fan running time | 0 | 0～65535 | h | * | |

6.2.10.5 Group P94 Troubleshooting Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P94.00 | Inverter minor fault | 1 | 0～3 | / | * | 0: no fault relay output for |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| | processing mode | | | | | minor fault<br>1: fault relay output for minor fault<br>2: fault relay output and shutdown for 52#PTC fault, and no automatic reset for the fault<br>3: 1 and 2 are valid. |
| P94.01 | Inverter fault automatic reset time | 10.0 | 0.0～180.0 | s | * | Inverter fault automatic reset time |
| P94.02 | Inverter fault automatic reset times | 0 | 0～100 | / | * | Inverter fault automatic reset times |
| P94.03 | Radiator overheating time | 0.5 | 0.0～180.0 | s | × | |
| P94.04 | Overspeed protection time | 1.0 | 0.0～180.0 | s | × | |
| P94.05 | Input default phase voltage threshold | 65 | 0～150 | V | × | |
| P94.06 | Braking resistor short times | 10 | 0～100 | per | × | |
| P94.07 | Encoder disconnection times confirmed | 2 | 0～100 | per | × | |
| P94.08 | Output default phase confirm time | 2.000 | 0.000～180.000 | s | × | |
| P94.09 | Relay fault confirm voltage | 90 | 0～350 | V | × | |
| P94.10 | CD misphase judgement threshold | 300 | 300～1000 | / | × | |
| P94.11 | ABZ protection threshold | 20 | 20～100 | % | × | |
| P94.12 | IGBT protection times | 2 | 0～1000 | / | × | |
| P94.13 | I2t protection selection | 0 | 0～3 | / | × | |
| P94.14 | Analog A0 disconnection value | 0.0 | 0.0～100 | % | × | |
| P94.15 | Analog A1 disconnection value | 0.0 | 0.0～100 | % | × | |
| P94.16 | Abnormal analog treatment | 0 | 0～5 | / | × | 0: no treatment<br>1: protection shutdown |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| | | | | | | 2: run at the current speed<br>3: run at the maximum amplitude limit<br>4: run at the minmum amplitude limit<br>5: run at the set value for multi-speed 15 |
| P94.17 | Temperature sampling disconnection treatment | 0 | 0～1 | / | × | 0: no treatment<br>1: protection shutdown |
| P94.18 | Communication protection | 1 | 0～1 | / | × | 0: no treatment<br>1: protection shutdown |
| P94.19 | Communication disconnection protection time | 2.000 | 0.000～65.535 | s | × | |
| P94.20 | Grounding protection times | 100 | 1～60000 | / | × | |

6.2.10.6 Group P95 Product Identification Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P95.00 | Inverter hardware version | 450.04 | | / | * | Inverter hardware version |
| P95.01 | Inverter software version | Factory | | / | * | Inverter software version |
| P95.02 | Version number | 100．01 | | / | * | Version number |
| P95.03 | Profibus_DP Software version | Factory | | | * | Profibus_DP software version |

6.2.10.6 Group P96 Inverter Product Parameters

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P96.00 | Inverter rated power | Automatic identification | 0.0～999.9 | kW | × | |
| P96.01 | Inverter rated current | | 0.0～999.9 | A | × | |
| P96.02 | Inverter maximum current | | 0.0～999.9 | A | × | |
| P96.03 | Inverter rated voltage | 380 | 0～460 | V | × | 0～480 |

| Function Code | Function Name | Factory Default | Setting range | Unit | Properties | Option description |
|---|---|---|---|---|---|---|
| P96.04 | Inverter power factor | Automatic identification | 0～99 | | * | |
| P96.05 | Inverter sensor current | | 0～9999 | A | * | 0～9999 |
| P96.06 | Inverter module rated current | | 0～9999 | A | * | 0～9999 |
| P96.07 | Built-in braking unit current | | 0～9999 | A | * | 0～9999 |
| P96.08 | 3-phase current balance coefficient | 1.000 | 0.000～99.999 | | * | 0.0～0.99 |
| P96.09 | ID_0 | 13567 | 0~65535 | / | * | 0~65535 |
| P96.10 | ID_1 | 36773 | 0~65535 | / | * | 0~65535 |
| P96.11 | ID_1 | 13142 | 0~65535 | / | * | 0~65535 |
| P96.12 | ID_1 | 14387 | 0~65535 | / | * | 0~65535 |
| P96.13 | ID_1 | 6276 | 0~65535 | / | * | 0~65535 |
| P96.14 | ID_1 | 8259 | 0~65535 | / | * | 0~65535 |
| P96.15 | ID_1 | 19 | 0~65535 | / | * | 0~65535 |
| P96.16 | ID_1 | 90 | 0~65535 | / | * | 0~65535 |

## 6.3 User Parameters Record Sheet

| Function | Set value | Function | Set value | Function | Set value |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

# Chapter 7 Parameter Details

## 7.1 Introduction to the Main Menu

### 7.1.1 Parameter Setting

Parameters in groups P0X-P9X will be displayed after it enters. When the login password is correct, the modifiable parameters can be modified. Refer to the following for their specific meanings.

| Simple table field | Description |
|---|---|
| Function code symbol | Function code symbol, for example P00.00 |
| Name of function code | Name of function code, to explain its roles |
| Function code option | List of function code parameter setting |
| Setting range | The minimum and maximum value set permitted by function code |
| Unit | V: voltage; A: current; ℃: degree; Ω: ohm; mH: millihenry rpm: rotating speed %: percentage; bps: baud rate; Hz, kHz: frequency; ms, s, min, h, kh: time; kW: power; /: no unit, etc |
| Factory default | Function code set value after reset to factory default operation (see P00.04) |
| Properties | ○: modifiable during running; ×: modifiable only during stop; *: read-only parameter, unchangeable |
| User setting | Parameter record by the user |

### 7.1.2 Motor Tuning

This option is motor self-learning. For the different motor firstly connecting to inverter, it is better to have a self-learning.

If the motor nameplate and other parameters are known, please directly write them into the related parameters; if the motor internal parameters are unknown, please execute parameter self-tuning. Press ENTER to determine and select the self-learning scheme.

0: normal running mode

1: encoder static self-learning (reserved)

2: encoder correction

3: encoder self-learning ends

4: motor static self-learning

5: motor dynamic self-learning

6: motor static advanced learning

7: encoder dynamic self-learning (reserved)

### 7.1.3 Fault Check

Press ENT to enter list of fault, 8 faults will be displayed in reverse time order. If some fault is

found, press ENT to display the bus voltage, output current and running frequency etc when it occurs.

52 fault codes totally, whose corresponding fault type is shown in the following table.

| Fault No. | Fault display | Fault No. | Fault display |
|---|---|---|---|
| 1 | Module overcurrent protection | 2 | ADC fault |
| 3 | Radiator overheating | 4 | Braking unit fault |
| 5 | Fuse blown fault | 6 | Output over-torque |
| 7 | Speed variation | 8 | Bus overvoltage protection |
| 9 | Bus undervoltage | 10 | Output default phase |
| 11 | Motor low speed overcurrent | 12 | Encoder fault |
| 13 | Current detected during parking | 14 | Reverse speed during running |
| 15 | Speed detected during parking | 16 | Motor phase sequence error |
| 17 | Forward overspeed | 18 | Reverse overspeed |
| 19 | UVW encoder phase sequence error | 20 | Encoder communication fault |
| 21 | abc overcurrent | 22 | Brake detection fault |
| 23 | Input overvoltage | 24 | UVW encoder disconnection |
| 25 | Spare | 26 | No self-learning for the encoder |
| 27 | Output overcurrent | 28 | Sincos encoder fault |
| 29 | Input default phase | 30 | Overspeed protection |
| 31 | Motor high speed overcurrent | 32 | Grounding protection |
| 33 | Capacitor aging | 34 | External fault |
| 35 | Output unbalance | 36 | Parameter setting error |
| 37 | Current sensor fault | 38 | Braking resistor short circuit |
| 39 | Too large instantaneous current value | 40 | Output contactor fault |
| 43 | Communication fault | 44 | Abnormal input power |
| 45 | $I^2t$ instantaneous value overcurrent | 46 | I2t effective value overcurrent |
| 47 | Abnormal analog input | 48 | High temperature sampling disconnection |
| 49 | PT detection fault | 50 | Humidity fault |
| 51 | Abnormal running output current | 52 | PTC over-temperature warning |

### 7.1.4 Parameter Processing

Press ENTER to enter. The function is used for change permission and initialization level of setting parameters.

0: Modification for all parameters.

1: No modification for all parameters.

2: Reset the parameters in group P0X to the factory defaults.

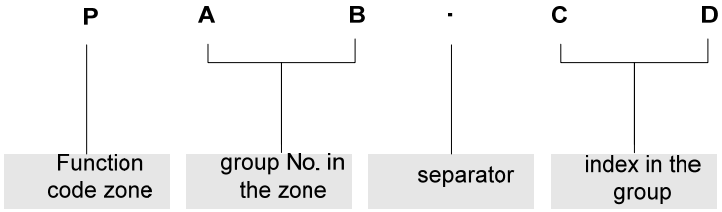
3: Reset the parameters other than in group P0X (user-defined function code visible and invisible area) to the factory defaults.

4: Reset all user parameters to the factory defaults.

Note: after parameter initialization, password set by the user resets automatically. Press ESC to return to the main menu interface.

## 7.2 Classification and Format of Parameter Groups

### 7.2.1 Format of Parameter Groups




### 7.2.2 Zoning of Parameter Groups

| Function code zone | Group No. in the zone | Description of function code |
|---|---|---|
| P0X user parameters | Group P00 | Password parameter group |
| P1X control parameters | Group P10 | Basic control parameter group |
| | Group P11 | Start parameter group |
| | Group P12 | Parking parameter group |
| | Group P13 | Braking function parameter |
| | Group P14 | V/F parameter group |
| P2X motor parameters | Group P20 | Basic motor parameter group |
| | Group P21 | Advanced motor parameter group |
| | Group P22 | Motor auxiliary parameter group |
| | Group P23 | Motor protection parameter group |
| P3X terminal control parameters | Group P30 | Digital input parameter group |
| | Group P31 | Digital output parameter group |
| | Group P32 | Analog input parameter group |
| | Group P33 | Analog output parameter group |
| P4X speed parameters | Group P40 | Basic speed parameter group |
| | Group P32 | Digital multi-speed parameter group |
| P5X process control parameters | Group P50 | Process open loop parameter group |
| | Group P51 | Process closed loop parameter group |
| P6X vector control parameters | Group P60 | Speed loop control parameter group |
| | Group P61 | Current loop control parameter group |
| | Group P62 | Torque control parameter group |
| | Group P63 | Compensation torque control parameter group |
| P7X enhanced control parameters | Group P70 | Limit and protection parameter group |
| | Group P71 | Control optimization parameter group |
| P8X communication parameters | Group P80 | Communication control selection group |
| | Group P81 | Modbus communication group |
| | Group P82 | Profibus DP communication group |
| P9X display parameters | Group P90 | Language selection group |
| | Group P91 | LCD display group |

| | | |
|---|---|---|
| | Group P92 | LED display group |
| | Group P93 | Running record parameter group |
| | Group P94 | Troubleshooting parameter group |
| | Group P95 | Inverter product identification parameter group |
| | Group P96 | Inverter product parameter |

## 7.3 Group P0X User Parameter Groups

### 7.3.1 Group P00 Basic Function Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P00.00 | Login password | 0~65535 | 0 |

This function is to prevent the irrelevant personnel from inquiring or modifying parameters, so as to protect safety of the inverter parameters.

00000: No password protection. All parameters may be inquired, no password provided for the inverter at factory.

Once the user password set becomes valid, when it enters parameter setting status again, all parameters can't be modified via operation panel unless the correct password is input, which can be viewed only. Parameter password is always shown as 00000.

**Note:** factory setting of AS450 series inverter isn't provided with user password (P00.00=0), therefore no password is provided for your first login.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P00.01 | Modify password | 0~65535 | 0 |

**Set a password:**

Input a 5-digit number as user password, then press ENTER to confirm it, and reset it once.

**Change password:**

Press ENTER to enter password authentification status, 00000 is displayed. Then enter parameter editing status after the correct password is input, select P00.01 (P00.00 parameter is displayed as 00000), input the new password and press ENTER to confirm it. Then reset the same password as P00.01 once again, indicating successfully setting the new password if "successful password setting" is shown.

**Cancel password:**

Press ENTER to enter password authentification status, 00000 is displayed, and then input the correct user password to enter parameter editing status. View P00.01 to be 00000, press ENTER to confirm, reset P00.01=00000, then the password is cancelled after "password clear" is shown.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P00.02 | Reserved password | 0~65535 | 0 |

When the setting password is forgotten, users can input the spare password to modify parameter value, including new password.

### 7.3.2 Group P01～09 —User Function Parameter

## 7.4 Group P1X Control Parameter Groups

### 7.4.1 Group P10 Basic Control Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P10.00 | Control mode selection | 0~5 | 0 |

The function is to set the control running mode of inverter. Of which, 0 is V/f control, 1, 3 and 5 mean vector speed control; 2 is vector torque control; 4 is spare.

0: **Voltage vector V/f control:** it applies to most applications, regulating frequency proportional to voltage, keep control speed under flux, without encoder.

Please reasonably set V/F control parameters in group P14 when selecting V/F control, to reach the good control effect.

1: **Vector control 2 without speed sensor:** it applies to the general variable speed drive applications with high speed control precision and greater torque requirement.

When selecting vector control, motor parameter self-tuning will be executed firstly, to correctly set the motor nameplate parameter as P20.xx~P20.xx and obtain the accurate motor parameters by starting motor parameter self-tuning. At the same time, vector control parameters in group P6X will be set reasonably, to realize its best control effect.

2: **Vector control with speed sensor:** it is similar to 3, it is provided with speed encoder, with higher control precision and better speed protection.

3: **Vector control with speed sensor:** Pulse encoder is required, which is able to realize speed with higher precision than vector control 2 without encoder speed feedback and torque performance

4: **Spare.**

5: **Vector control 1 without speed sensor:** Pulse encoder isn't required, which is able to realize speed with higher precision than open loop VF and torque performance. Performance index is less than vector control 2 without speed sensor, but not sensitive to motor parameters. It applies to the applications where motor parameters can't easily be obtained.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P10.01 | Rotation mode selection | 0~3 | 0 |

P10.01 is used to set a mode to control inverter start and stop by use of terminals X0 (forward) and X1 (reverse) under terminal running command given mode.

**0:** 2-wire 1;

| K2 K1 | Running command |
|---|---|
| 0 0 | Stop |
| 1 0 | Reverse |
| 0 1 | Forward |
| 1 1 | Stop |

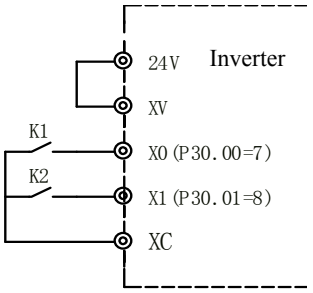



**Figure 7-1 2-wire running mode 1**

**1:** 2-wire 2;

| K2 K1 | Running command |
|---|---|
| 0 0 | Stop |
| 1 0 | Stop |
| 0 1 | Forward |
| 1 1 | Reverse |

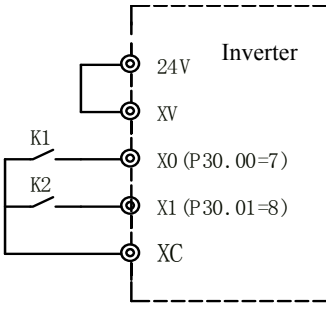



**Figure 7-2 2-wire running mode 2**

**2:** 3-wire 1;

Terminal Xi (i=2 ~ 7) sets the function "9: 3-wire running control".

When K3 closes, K0 (forward) and K1 (reverse) control are effective; when K3 opens, K0 and K1 control are invalid, and the inverter stops.

Rising edge of terminal X0 indicates forward running command; while that of terminal X1 is reverse running command.

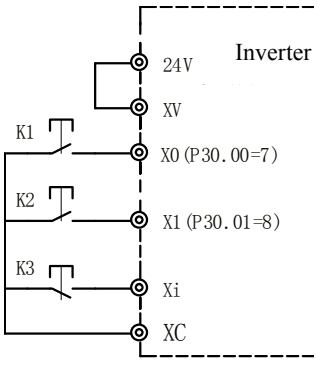
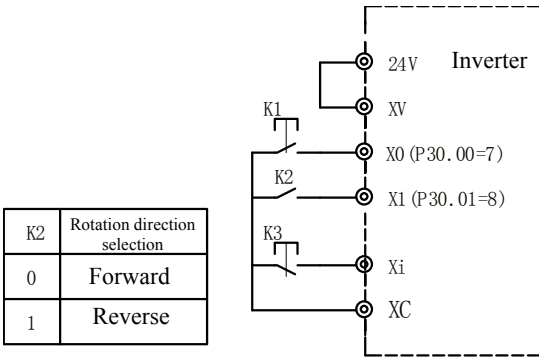



**Figure 7-3 3-wire running mode 1**

**3:** 3-wire 2;




| K2 | Rotation direction selection |
|---|---|
| 0 | Forward |
| 1 | Reverse |

**Figure 7-4 3-wire running mode 2**

Terminal Xi (i=2 ~ 7) sets the function "9: 3-wire running control".

Rising edge of terminal K1 indicates running command; when K2 opens, indicating the forward direction command; when K3 closes, indicating the reverse direction command. When K3 opens, the inverter stops.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P10.02 | Running command given mode | 0~4 | 0 |

There are 3 different inverter running command given modes for selection.

0: Operation panel running command given mode: execute the operations such as run, stop and forward/reverse rotation with the buttons RUN (F1), STOP (F2) and LO/RE (F3) on the operation panel.

1: Terminal running command given mode: execute the operations such as run, stop and forward/reverse rotation by defining the multifunctional terminals X0 ~ X7. Refer to P30.00 ~ P30.07.

2: Communication given mode: execute the operations such as run, stop and forward/reverse rotation by means of Modbus communication. Refer to the Appendix Modbus Communication Protocol.

3: CAN given: optional, give command by means of CANBus.

4: Profibus_DP given: optional, give command by means of Profibus_DP.

See the related supplementary agreement for communication protocol of 3, 4.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P10.03 | Frequency/speed given mode 1 | 0~16 | 0 |

The function applies to frequency given under V/f control, vector control without sensor and vector control with sensor. See the function code in group P10.00 for control mode.

0: Panel digital frequency given, set frequency given with P40.00

Increase or decrease the frequency with ▲ and ▼ during running, at this time, stop will be held, but not power failure.

1: Digital multi-speed given target speed

Digital multi-speed terminals 0-3 are effective, then frequency is determined by this terminal combination, see P41.00 ~ P41.15.

2: Spare.

3: A0 analog target speed given

4: A0 analog current speed given

5: A1 analog target speed given

6: A1 analog current speed given

Give target speed via analog input port, at this time, output frequency is calculated according to acceleration and deceleration time in group P40. Also give current speed, then acceleration and deceleration time in group P40 are invalid.

7: Communication given current speed

Standard configuration, see Modbus protocol.

8: Function given target speed

Macro situation in industrial applications.

9: Spare.

10: Spare.

11: Spare.

12: Communication given target speed

Standard configuration, see Modbus protocol.

13: CAN given current speed

14: CAN given target speed

Optional, give speed command by means of CANBus.

15: Up/Down given speed

16: Profibus_DP given speed

Optional, give speed command by means of Profibus_DP

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P10.04 | Torque given mode | 0~6 | 0 |

Torque given shares the following means under torque control mode:

**0: panel given** Panel digital torque given

**1:** A0 analog given

**2:** A1 analog given

When torque given mode is set as analog input, it must be correctly matched when setting definition analog port function parameters, for example: P10.04 is set as 1, P32.01 must be set as 3. Similarly, P10.04 is set as 1, P32.07 also must be set as 3.

**3: Communication given torque:** Give target torque via communication port, see group P80 for communication mode.

**4: Function given target torque:** In some special industries, given torque will be based on designing the different performance functions as required.

**5: ModBus given torque:** Standard configuration, see Modbus protocol.

**6: CAN given torque:** Optional, give torque command by means of CANBus.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P10.05 | Compensating torque given mode | 0~6 | 0 |

Set compensating torque for start under closed loop vector mode. Compensating torque selection modes:

**0: No compensating torque**

**1: Digital compensating torque**

Set compensating torque by light full load digital input, see group P63.

**2: Analog A0 given compensating torque**

**3: Analog A1 given compensating torque**

Set compensating torque via analog input port. Compensating torque direction is determined by analog.

**4: Communication given compensating torque**

Standard configuration, see Modbus protocol

**5: Automatic torque compensation**

Automatic torque compensation main serves lifting industry, which is to remember torque when zero speed stops, then release the brake until all remembered torque is added. It only applies to closed loop control.

**6: Profibus given compensation**

Optional, give compensating torque command by means of Profibus.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P10.06 | Speed limit selection | 0~4 | 0 |

Select the different channel to limit speed given and avoid over-speed. It is effective only under torque control mode.

**0: Internal parameter limit:**Limit by means of the upper and lower limit frequency of P70.00 and P70.01.

**1: Analog 0 limit**

**2: Analog 1 limit:** 10V corresponding to the maximum output frequency of P70.02.

**3: Spare.**

**4: ModBus communication limit:** See Modbus protocol.

**5: Automatic limit**

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P10.07 | Frequency/speed given mode 2 | 0~16 | 0 |

Same as P10.03 frequency/speed given mode 1.

## 7.4.2 Group P11 Start Control Parameter

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.00 | Start mode | 0~2 | 0 |

Different start modes can be adopted according to different applications.

**0:** Run from the starting frequency P11.01, then accelerate to the set frequency after starting frequency holding time P11.02.

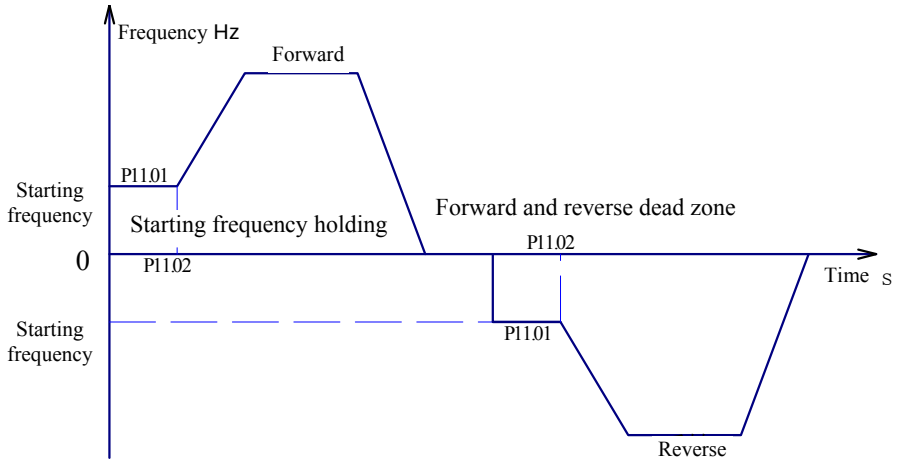



**Figure 7-5 Schematic of start mode for starting frequency**

**1:** Firstly inject DC, to have DC excitation and braking for the motor. Injection quantity and time is set by P11.03 and P11.04. After injection time is reached, run from the starting frequency P00.01, then accelerate to the set frequency after starting frequency holding time P11.02.

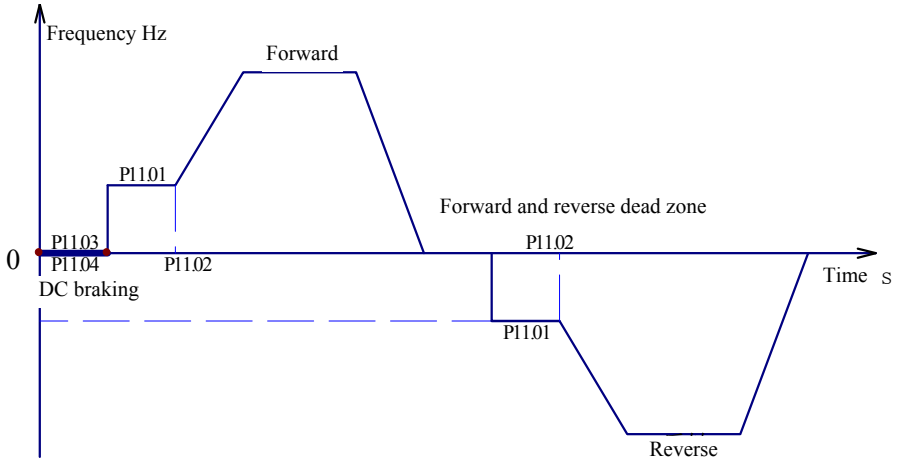



**Figure 7-6 Schematic of start mode for DC braking**

**2:** Speed tracking start

The inverter is able to identify the rotating speed of the motor, and execute direct tracking start from the identified frequency. During starting, current and voltage shall be smooth, free from shock.

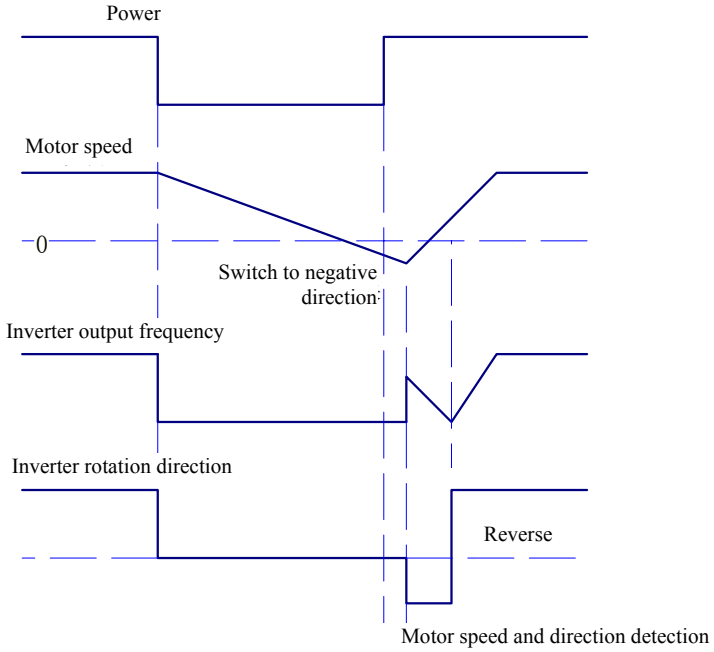



**Figure 7-7 Schematic of speed tracking start mode**

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.01 | Start holding frequency (Hz) | 0.00~30.00 | 0.00 |
| P11.02 | Starting frequency holding time(s) | 0.00~3600.00 | 0.00 |

Starting frequency is the initial frequency when the inverter starts, shown as fs in the figure. Starting frequency holding time is the time to keep running under starting frequency of the inverter during its starting, shown as the figure. The inverter won't work when frequency command is below the starting holding frequency.

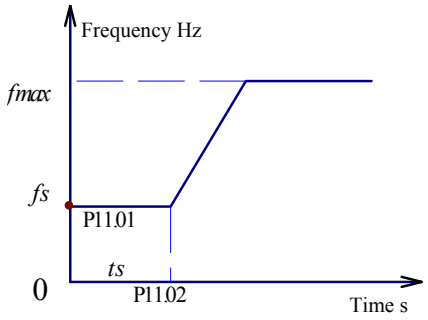



**Figure 7-8 Schematic of starting frequency and starting time**

The inverter begins to run from starting frequency P11.01, then accelerate at the set acceleration time after starting frequency holding time P11.02.

Note: for the applications with heavy load starting, it is advantageous to properly set starting frequency holding time. Under encoder speed feedback vector control, factory default of the starting frequency is 0.00Hz, while others are set as 0.05Hz.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.01 | Start DC injection current (%) | 0.00~120.00 | 30.00 |
| P11.02 | Start DC injection time (s) | 0.0~99.9 | 5.0 |

P11.03 and P11.04 are valid only when "DC braking first, then starting mode (P11.00=1)" is chosen in start running mode, shown as the following figure:

Setting of start DC braking current (P11.03) is percentage to the inverter rated current, if the DC braking current set is greater than 120% rated motor current, then the current injected will be 120% motor rated current. Heavy load: 0.0 ~ 120.0%; light load: 0.0 ~ 90.0%.

Note: it applies to motor open control in lifting industry. Motor open conditions are met only when the current to start forward rotation of the motor is greater than P11.03 current value.

Start DC braking time (P11.04) is the action time injected. When P11.04=0, no DC braking process is provided.

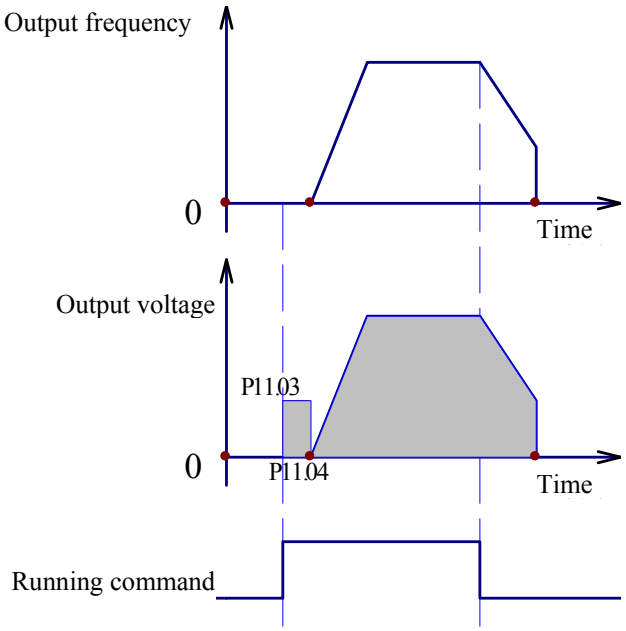



**Figure 7-9 DC braking schematic**

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.05 | Excitation time (s) | 0.0~99.9 | 0.3 |

Excitation time means the time to set up the flux in advance before the motor is started, with the purpose of reaching quick response when the motor starts. When there is running command, firstly enter the pre-excitation status according to the time set by this function code. After magnetic flux is set up, enter the normal accelerated operation. If the function code is set as 0, indicating no exciting process required. Excitation time default parameter is set as 0 under VF control, modifiable. Other control defaults are 0.3, modifiable.

Note: the motor may rotate during pre-exciting, at this time, please apply mechanical braking.

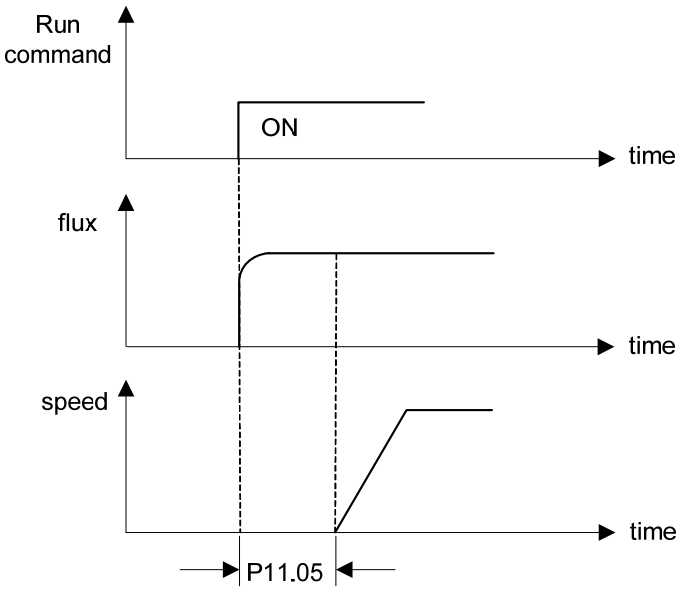



**Figure 7-10 Pre-excitation schematic**

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.06 | Zero servo time (s) | 0.00~99.9 | 0.0 |
| P11.07 | Brake actuation time (s) | 0.0~99.99 | 0.20 |

Brake actuation time is the time from the outer brake receiving open command to being fully opened. The brake enters zero servo time, namely zero speed holding time.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.08 | Tracking delay time (ms) | 0~65535 | 1000 |

The time is used to wait the motor to demagnetize. If overcurrent appears at beginning of tracking, then it will be increased.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.09 | Track zero voltage time (ms) | 0~65535 | 100 |

Enter tracking waiting time.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.10 | Tracking voltage Kp | 0~65535 | 0.20 |

Kp during tracking. If it is too small, tracking process will be longer, otherwise overcurrent may be caused during tracking.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.11 | Tracking voltage Ki | 0~6553.5 | 0.30 |

Ki during tracking. If it is too small, tracking process will be longer, otherwise overcurrent may be caused during tracking.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.12 | Tracking voltage Kd | 0~6553.5 | 0.00 |

Kd during tracking. If it is too small, overshoot current won't be controlled obviously during tracking, otherwise, if it is too large, overcurrent may be caused during tracking.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.13 | Tracking exit delay (ms) | 1000~65535 | 1000 |

Ensure to exit from tracking process steadily. Its increase is helpful to exit steadily.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.14 | Maximum current during tracking (%) | 0.0~200.0 | 100.0 |

Percentage of the motor rated current. When small inverter is used to drive large motor, ensure the maximum current during tracking is less than the inverter rated current. If overcurrent appears during tracking, it should be reduced.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.15 | Tracking frequency change gain (% | 0.0~100.0 | 10.0 |

If overvoltage or P60.09 greater than 600V appears during tracking, this value shall be decreased.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.16 | Maximum voltage during tracking (V) | 0~65535 | 0 |

This parameter is only for reading, to monitor the maximum bus voltage during tracking.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.17 | Initial tracking frequency (Hz) | 0.00~100.00 | 50.00 |

It is set as the maximum running frequency before tracking. If inertia parking speed of the system drops speedily, this value may be decreased properly.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.18 | Maximum current during tracking (A) | 0.0~6553.5 | 0.0 |

This parameter is only for reading, to monitor the maximum effective current value during tracking.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P11.19 | Reverse opening current (%) | 0.00~1000.00 | 20.00 |

It applies to the motor open control in lifting industry. Open conditions will be met only when the current to start reverse is greater than P11.19.

### 7.4.3 Group P12 Parking Control Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P12.00 | Parking mode | 0~4 | 0 |

Different parking modes will be adopted according to different applications.

0: inverter output lockout, free parking for the motor

1: slow down and stop as the set deceleration time

2: slow down and stop as the set DC braking. When the frequency is less than DC braking starting frequency P12.03, inject DC braking current P12.04. DC braking time is determined by P12.05.

3: slow down and stop as the set deceleration time. Excitation is kept on the motor after stop, to fast respond to starting when running command is received.

4: Slow down and stop as the set deceleration time. Maintain the current torque at zero speed, then stop after P12.6 lasted.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P12.01 | Parking holding frequency (Hz) | 0.00~300.00 | 0.00 |
| P12.02 | Parking frequency holding time (s) | 0.1~99.9 | 0.0 |

The inverter decelerates to parking frequency P12.01 from its normal running speed, then slow down to zero as the set deceleration time after parking frequency holding time P12.02, which is advantageous to stop smoothly.

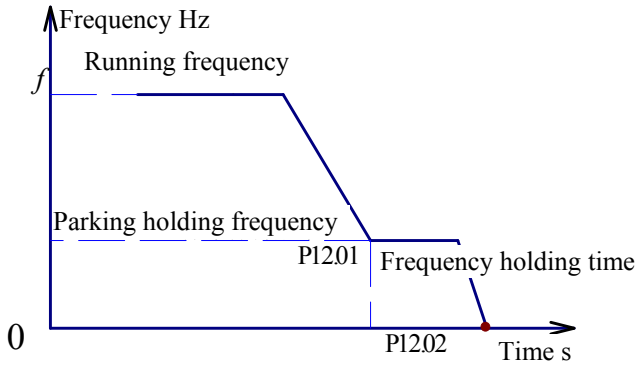



**Figure 7-11 Parking holding frequency schematic**

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P12.03 | DC braking starting frequency (Hz) | 0.00~10.00 | 2.50 |
| P12.04 | Parking DC braking current (%) | 0.00~100.00 | 50.0 |
| P12.05 | Parking DC braking time (s) | 0.0~10.0 | 0.5 |

P12.03~P12.05 are valid only when stop mode selects “deceleration + DC braking (P12.00=2)”.

Setting of parking DC braking current (P12.03) is percentage to the inverter rated current, if DC braking current set exceeds 120% motor rated current, then the injected current will be 120% motor rated current. Heavy load: 0.0 ~ 120.0%; light load: 0.0 ~ 90.0%.

Start current braking time (P12.04) is the injected actuation time. When P12.04=0, no DC braking process is provided.

When P12.00=2, P12.03 can be set as braking starting frequency, to apply fast braking.

P12.03 sets DC braking current, which is percentage to the inverter rated current.

Variable torque load: 0.0 ~ 90.0%.

P12.04 sets the actuation time for DC braking.

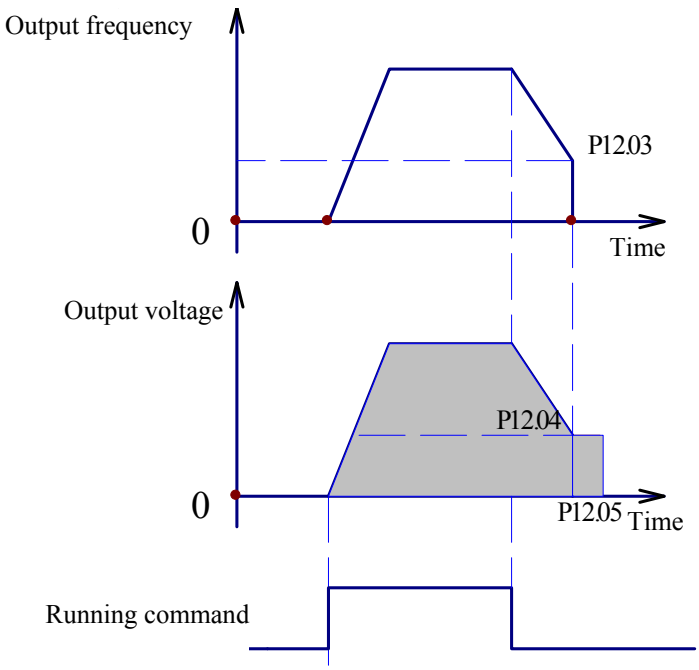



**Figure 7-12 Parking DC braking schematic**

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P12.06 | Stop excitation holding time (s) | 0~65535 | 0 |

Parking mode adopts "deceleration + excitation/torque holding", the inverter stops after excitation/torque holding time is greater than P12.06.

### 7.4.4 Group P13 Braking Function V/F Control Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P13.00 | Dynamic braking selection | 0~1 | 1 |
| P13.01 | Braking turning-on voltage | 620~750 | 660 |
| P13.02 | Braking unit service time | 0.0~300.0 | 60.0 |

P13.00 dynamic braking selection reflects whether the inverter applies dynamic braking.

0: Open dynamic braking function.

1: Dynamic braking function not used.

For the applications with big rotational inertia and fast braking & stop, braking unit and braking resistor matched to them may be selected, also braking parameters will be set to realize fast braking and stop.

P13.02 braking unit service time, P13.01 braking turning-on voltage are valid to the inverter provided with built-in braking unit only.

Braking unit actuation service time can be set, generally 100s.

Regulate P13.01 to select the action voltage of braking unit, to realize fast dynamic braking and stop.

Note: set P13.00 as 1 if built-in braking unit is applied, refer to 1.9 "Braking resistor selection" for its components type.

### 7.4.5 Group P14 V/F control Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P14.00 | V/F curve given | 0~4 | 0 |
| P14.01 | V/F voltage value V0 (V) | 0.0~460.0 | 76.0 |
| P14.02 | V/F frequency value F0 (Hz) | 0.00~300.00 | 10.00 |
| P14.03 | V/F voltage value V1 (V) | 0.0~460.0 | 152.0 |
| P14.04 | V/F frequency value F1 (Hz) | 0.00~300.00 | 20.00 |
| P14.05 | V/F voltage value V2 (V) | 0.0~460.0 | 228.0 |
| P14.06 | V/F frequency value F2 (Hz) | 0.00~300.00 | 30.00 |
| P14.07 | V/F voltage value V3 (V) | 0.0~460.0 | 304.0 |
| P14.08 | V/F frequency value F3 (Hz) | 0.00~300.00 | 40.00 |
| P14.09 | V/F voltage value V4(V) | 0.0~460.0 | 380.0 |
| P14.10 | V/F frequency value F4 (Hz) | 0.00~300.00 | 50.00 |

Parameter P14.00 is used to determine the different V/F curves under voltage vector V/F control running mode (P10.00=0).

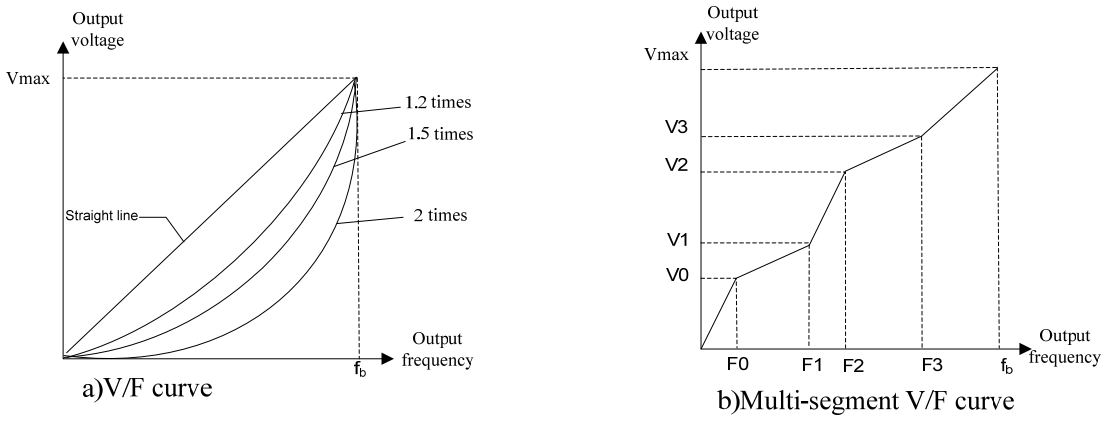



**Figure 7-13 VF curve schematic**

P14.00=0 applies to the constant torque load, sharing a linear relationship of factor 1 between V and F. Refer to the straight line in figure for details.

P14.00=4 user-defined curve, which applies to the sectional constant torque load, shown as the figure.

In Figure 7-12: F0<F1<F2<F3<F4≤fb, fb is the basic running frequency P40.01.

V0≤V1≤V2≤V3<V4≤Vmax, V0, V1, V2, V3 and V4 are the actual output voltage relative to the maximum output voltage and rated frequency (V1= (Vmax/fb)* F1 default Vmax=380V, fb=50Hz).

P14.00＝1~3 applies to the variable torque load in fan and water pump. P14.00 is set as 1 ~ 3, corresponding to 1.2-power curve, 1.5-power curve and second power curve respectively, shown as Figure 7-12. Of which, second power curve applies to water supply, while the rest applies to other medium liquid load. Choose the proper curve according to the actual conditions.

# 7.5 Group P2X Motor Parameter Groups

## 7.5.1 Group P20 Basic Motor Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P20.00 | Motor 1 type | 0~1 | 0 |
| P20.01 | Motor 1 rated power (kW) | 0.4~400.0 | |
| P20.02 | Motor 1 rated current (A) | 0.1~999.9 | |
| P20.03 | Motor 1 rated frequency (Hz) | 0~300 | 50 |
| P20.04 | Motor 1 rated speed (rpm) | 0~30000 | 1460 |
| P20.05 | Motor 1 rated voltage (V) | 0~460 | 380 |
| P20.06 | Motor 1 poles | 2~128 | 4 |
| P20.07 | Motor 1 rated slip frequency (Hz) | 0.10~655.35 | 1.40 |

P20.00 motor type: 0: asynchronous motor

P20.01 ~ P20.07 and P20.11 are used to set motor parameters driven by the inverter. Correctly set the parameters according to the motor nameplate prior to use.

P20.06 is used to set motor poles based on the nameplate. If no motor poles parameter is provided on the nameplate, you can calculate it according to the following formula:

Poles = (120×f ) ÷n.

Where: n is rated speed and f is rated frequency.

For the calculated value, the even integer will be the poles.

Note: the inverter power grade shall be matched with the motor.

P20.07 is used to set the slip frequency.

If no slip frequency data is provided on the motor nameplate, you can calculate P20.07 with the following formula:

Set rated frequency as f (P20.03), rated speed as n (P20.04) and motor poles as p (P20.06),

then: slip frequency＝f-((n ×p)÷120).

For example: rated frequency 50Hz, rated speed 1430rpm and motor poles 4,

Then P20.07＝50-((1430×4)÷120)＝2.33Hz.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P20.08 | Motor 1 maximum slip frequency (Hz) | 0.1~655.35 | 2.80 |
| P20.09 | Motor 1 phase sequence | 0~1 | 1 |
| P20.10 | Motor 1 no-load current coefficient (%) | 0~60.0 | 30.00 |

P20.08 sets the motor maximum slip frequency, which is 2 times of rated slip frequency typically.

P20.09 sets the motor rotation direction, 0 is negative phase sequence rotation, while 1 is positive phase sequence rotation.

P20.10 sets the motor no-load current coefficient, about 30% typically.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P20.11 | Motor 1 rated torque | 0.1~6553.5 | 450.0 |
| P20.12 | Motor 1 maximum power factor (%) | 100~300 | 200 |

P20.12 The maximum motor power factor means the maximum torque to limit the current permissible output of the inverter under closed loop vector control mode. When the current actual output power of the inverter is below the power set in P20.12, the maximum torque permitted to output by the inverter will be P70.04 output torque limit value; otherwise the maximum torque output by the inverter will be reduced gradually, with maintain power not greater than P20.12.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P20.13 | Motor 1 maximum frequency (Hz) | 0~300 | 50 |

P20.01 ~ P20.07 and P20.11 are used to set motor parameters driven by the inverter. Correctly set the parameters according to the motor nameplate prior to use.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P20.14 | Motor 2 type | 0~1 | 0 |
| P20.15 | Motor 2 rated power (kW) | 0.4~400.0 | |
| P20.16 | Motor 2 rated current (A) | 0.1~999.9 | |
| P20.17 | Motor 2 rated frequency (Hz) | 0~300 | 50 |
| P20.18 | Motor 2 rated speed (rpm) | 0~30000 | 1460 |
| P20.19 | Motor 2 rated voltage (V) | 0~460 | 380 |
| P20.20 | Motor 2 poles | 2~128 | 4 |
| P20.21 | Motor 2 rated slip frequency (Hz) | 0.10~655.35 | 1.40 |
| P20.22 | Motor 2 maximum slip frequency (Hz) | 0.10~655.35 | 2.80 |
| P20.23 | Motor 2 phase sequence | 0~1 | 1 |
| P20.24 | Motor 2 no-load current coefficient (%) | 1.00~60.00 | 30.00 |
| P20.25 | Motor 2 maximum power factor (%) | 50~400 | 250 |
| P20.26 | Motor 2 maximum frequency (Hz) | 0~300 | 50 |

P20.14 ~ P20.26 set motor 2, according to the parameters specification of motor 1.

## 7.5.2 Group P21 Advanced Motor Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P21.00 | Motor turning | 0~6 | 0 |

P21.00 motor tuning

0: normal running

1: encoder static self-learning (reserved)

2: encoder self-learning correction

3: encoder self-learning ends

4: motor static self-learning

5: motor dynamic self-learning

6: motor static advanced self-learning

7: encoder dynamic self-learning (reserved)

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P21.01 | Motor 1 stator resistance (Ω) | 0.000~65.000 | 0.072 |
| P21.02 | Motor 1 rotor resistance (Ω) | 0.000~65.000 | 0.054 |

| | | | |
|---|---|---|---|
| P21.03 | Motor 1 stator inductance (H) | 0.0000~6.0000 | 0.0221 |
| P21.04 | Motor 1 rotor inductance (H) | 0.0000~6.0000 | 0.0221 |
| P21.05 | Mutual inductance 1 (H) | 0.0000~6.0000 | 0.0210 |

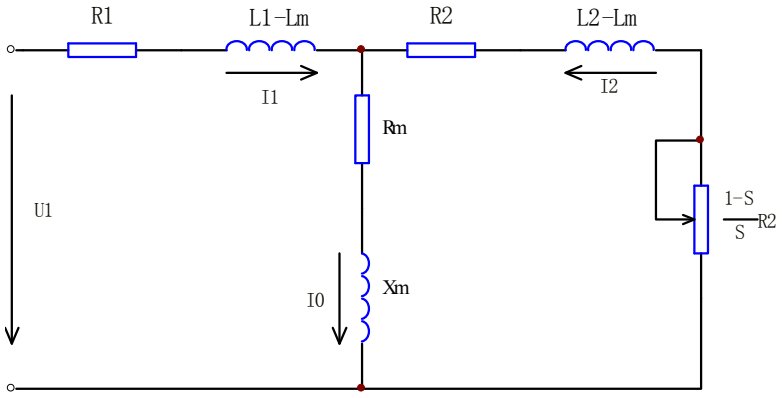



**Figure 7-14 Circuit diagram of asynchronous motor steady state equivalent**

$R_1$, $R_2$, $L_1$, $L_2$, $L_m$ and $I_0$ in the figure respectively stand for: stator resistance, stator inductance, rotor resistance, rotor inductance, mutual inductance and excitation current. Excitation current may be calculated by the rated current and power factor of the motor, also may be measured by rotation self-tuning.

Relationship between rated torque current, excitation current and the motor rated current:

Rated torque current= power factor × motor rated current

No-load excitation current=√(1-power factor^2) × motor rated current × motor efficiency, generally the motor efficiency is 85%.

As the internal characteristic parameters, P21.01, P21.02, P21.03, P21.04 and P21.05 are only valid to the asynchronous motor, and will be automatically obtained by the self-learning operation of the inverter to the motor.

The key motor parameters affecting the inverter running control could be determined through parameter self-tuning, which will be saved in the inverter automatically after parameter self-tuning is completed, until the next parameter input or parameter self-tuning again.

Parameter self-tuning process is shown as:

Correctly input P20.00 ~ P20.11 according to the motor nameplate; correctly set the basic running frequency P40.01, maximum output frequency P70.02 and maximum output voltage P70.03; set the proper acceleration and deceleration time P40.02 and P40.03.

Select the mode to execute parameter self-tuning (see start menu selection):

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P21.06 | Motor 2 stator resistance (Ω) | 0.000~65.000 | 0.072 |
| P21.07 | Motor 2 rotor resistance (Ω) | 0.000~65.000 | 0.054 |
| P21.08 | Motor 2 stator inductance (H) | 0.0000~6.0000 | 0.0221 |
| P21.09 | Motor 2 rotor inductance (H) | 0.0000~6.0000 | 0.0221 |
| P21.10 | Mutual inductance 2 (H) | 0.0000~6.0000 | 0.0210 |

Tuning of motor 2 parameters is the same as motor 1.

### 7.5.3 Group P22 Motor Auxiliary Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P22.00 | Rotational inertia (kgm^2) | 0~ | 20 |

P22.00 sets the motor rotational inertia, whose initial value can be calculated according to mechanical inertia, with fine adjusting in actual running.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P22.01 | Encoder 1 type | 0~3 | 0 |
| P22.02 | Encoder 1 pulses | 500~16000 | 1024 |
| P22.03 | Encoder 1 frequency division factor | 0~7 | 0 |
| P22.04 | Encoder 1 position angle | 0~360 | 0 |
| P22.05 | Encoder 1 feedback speed filtering time (ms) | 0~1000 | 0 |
| P22.06 | Encoder 1 direction | 0~1 | 1 |
| P22.07 | SinCos encoder subdivision coefficient | 7、9、11 | 11 |
| P22.08 | Resolver encoder 1 poles | 2~128 | 2 |

Select the encoder 1 type, pulses per turn, frequency division factor etc. in this group. Position angle is read from self-learning, non-settable. Filtering time is adjusted within the controllable range. Set P22.06 for the encoder according to actual conditions or change the hardware wire.

P22.01 sets the encoder type, 0: incremental; 1: SinCos; 2: EnDat ; 3: Resolver

P22.02 sets the encoder pulses

P22.03 is frequency division coefficient, 0~7 are corresponding to 1~128 frequency division.

P22.05 the encoder feedback filtering time is 0 when P10.00=3, and it is 5ms under other control modes, both modifiable.

P22.06 selects the encoder feedback direction, the default value is 1, no modification typically. But if the encoder wiring error is found, causing that feedback direction is opposite to the actual direction, it may be adjusted by modifying P22.06.

P22.07 sets SinCos encoder subdivision coefficient, and regulate it according to actual conditions.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P22.09 | Encoder 2 type | 0~3 | 0 |
| P22.10 | Encoder 2 pulses | 500~16000 | 1024 |
| P22.11 | Encoder 2 position angle | 0~360 | 0 |
| P22.12 | Encoder 2 direction | 0~1 | 1 |
| P22.13 | Resolver encoder 2 poles | 2~128 | 2 |

Select the encoder 2 type, pulses per turn, frequency division factor etc. in this group. Position angle is read from self-learning, non-settable. Filtering time is adjusted within the controllable range. Select P22.12 for the encoder according to actual conditions or change the hardware wire.

P22.12 selects the encoder feedback direction, the default value is 1, no modification typically. But if the encoder wiring error is found, causing that feedback direction is opposite to the actual direction, it may be adjusted by modifying P22.06.

### 7.5.4 Group P23 Motor Protection Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P23.00 | Motor overheat protection selection | 0~2 | 0 |
| P23.01 | Motor sensor protection threshold value (V) | 0.00~10.00 | 5.00 |
| P23.02 | Motor overcurrent protection time (s) | 0.5~300.0 | 60.0 |

P23.00 motor overheat protection selection:

0: no protection

1: input via analog A0

2: input via analog A1

P23.01 is the set protection threshold value and P23.02 is the set overcurrent protection time.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P23.03 | Motor low speed overcurrent threshold value (%) | 0.00~150.00 | 150.00 |
| P23.04 | Motor low speed overcurrent time (s) | 0.1~120.0 | 60.0 |
| P23.05 | Motor high speed overcurrent threshold value (%) | 0.00~150.00 | 120.00 |
| P23.06 | Motor high speed overcurrent time (s) | 0.1~60.0 | 30.0 |

P23.03 ~ P23.06 set the motor speed and overcurrent threshold value, with overspeed set within 20%. Overcurrent rate and time are inversely proportional function, the higher the overcurrent peak, the shorter the set time. These parameters can be set after the motor report. Separate the high speed and low speed as 20%.

## 7.6 Group P3X Terminal Parameter Groups

### 7.6.1 Group P30 Digital Input Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P30.00 | Terminal X0 input function selection | 0~63 | 7 |
| P30.01 | Terminal X1 input function selection | 0~63 | 8 |
| P30.02 | Terminal X2 input function selection | 0~63 | 0 |
| P30.03 | Terminal X3 input function selection | 0~63 | 0 |
| P30.04 | Terminal X4 input function selection | 0~63 | 8 |
| P30.05 | Terminal X5 input function selection | 0~63 | 0 |
| P30.06 | Terminal X6 input function selection | 0~63 | 0 |

Definition list of function input terminals:

| No. | Function definition | No. | Function definition |
|---|---|---|---|
| 0 | No-function | 1 | Acceleration and deceleration time selection 0 |
| 2 | Acceleration and deceleration time selection 1 | 3 | Digital speed 0 |
| 4 | Digital speed 1 | 5 | Digital speed 2 |
| 6 | Digital speed 3 | 7 | Forward (FWD) |

| | | | |
|---|---|---|---|
| 8 | Reverse (REV) | 9 | 3-wire running control |
| 10 | Spare | 11 | Spare |
| 12 | Spare | 13 | External reset terminal |
| 14 | External fault terminal | 15 | External self-learning input terminal |
| 16 | Emergency power supply running | 17 | Weighing compensation input |
| 18 | Base lockout | 19 | Light load switch input |
| 20 | Heavy load switch input | 21 | Output contactor detection |
| 22 | Brake contactor detection | 23 | Brake switch detection |
| 24 | Motor selection | 25 | Encoder selection |
| 26 | Function parameter 0 (spare) | 27 | Function parameter 1 (spare) |
| 28 | Pulse frequency DI0 input (spare) | 29 | Pulse frequency DI1 input (spare) |
| 30 | Speed/torque switching | 31 | Frequency increase (no hold) |
| 32 | Frequency decrease (no hold) | 33 | Emergency stop signal |
| 34 | FWD deceleration input | 35 | REV deceleration input |
| 36 | FWD stop input | 37 | REV stop input |
| 38 | Frequency increase (no hold) | 39 | Frequency decrease (no hold) |
| 40 | Inching frequency selection | 41 | Command switching to operation panel |
| 42 | Command switching to terminal | 43 | Command switching to upper computer |
| 44 | Open loop main and auxiliary given switching | 45 | PID main given switching to internal |
| 46 | PID main given switching to analog A0 | 47 | auxiliary given switching to invalid |
| 48 | PID auxiliary given switching to analog A0 | 49 | FJOG command |
| 50 | RJOG command | 51 | PID main given switching to analog A1 |
| 52 | PID auxiliary given switching to analog A1 | 53 | Speed given mode selection |
| Others | Spare | | |

Meaning of the function code:

0: no-function

1: acceleration and deceleration time terminal 0

2: acceleration and deceleration time terminal 1

Refer to the following table for the usage.

| **Acceleration and deceleration time selection 0** | **Acceleration and deceleration time selection 1** | **Acceleration and deceleration time selection** |
|---|---|---|
| OFF | OFF | Acceleration and deceleration time 0 (P40.02, P40.03) |
| OFF | ON | Acceleration and deceleration time 1 (P40.04, P40.05) |
| ON | OFF | Acceleration and deceleration time 2 (P40.06, P40.07) |
| ON | ON | Acceleration and deceleration time 3 (P40.08, P40.09) |

3: digital speed 0

4: digital speed 1

5: digital speed 2

6: digital speed 3

See P41.00 ~ P41.15 for the usage.

7: terminal forward input (FWD)

8: terminal reverse input (REV)

9: 3-wire running control

They are valid only in terminal running command given mode (P10.02=1). See P10.01 for the usage.

10: spare

11: spare

12: spare

See P51.14 ~ P51.21 for the usage.

13: external reset terminal

Valid external reset terminal signal, the external signal could reset the fault of the inverter

14: external fault terminal

Valid external fault terminal signal, the inverter stops running.

15: external self-learning input terminal, magnetic pole tuning input

External input signal controls self-learning start

16: emergency power supply running

Indicate the inverter under the external emergency conditions

17: weighing compensation input

Weighting compensation command input set by the user in specific applications

18: base lockout

Effectively prohibit the inverter output

19: light load switch input

20: heavy load switch input

These two functions are used in elevator industry. Comparing the actual load weight with the balance weight, if the former is less than the latter, indicating light load; otherwise heavy load.

21: output contactor feedback

It is used with output function 17 typically, to control the inverter output contactor, so as to confirm closing status of the contactor before current is output from the inverter, and timely cut off the inverter output meanwhile the contactor is tripping.

22: brake contactor feedback

It is used with output function 18 typically, to judge whether output contactor of the brake closes.

23: brake limit feedback

It is used with output function 18 typically, to judge whether the brake opens.

24: motor selection

Refer to the following table for its usage:

| Motor selection | Motor parameter group selection |
|---|---|
| OFF | Motor 1 parameter group |
| ON | Motor 2 parameter group |

25: encoder selection

| Encoder selection | Encoder parameter group selection |
|---|---|
| OFF | Encoder 1 parameter group |
| ON | Encoder 2 parameter group |

26: function parameter 0: spare
27: function parameter 1: spare
28: pulse input 0: spare
29: pulse input 1: spare
30: speed/torque mode switching
Valid input signal, the inverter control mode is switched to torque mode from speed mode.
31: frequency increase (no hold)
When the signal is valid, target frequency continues to increase, until reaching the amplitude limit; otherwise the current frequency will be kept. Stop and outage frequency is 0.
32: frequency decrease (no hold)
When the signal is valid, target frequency continues to decrease, until 0; while the signal is invalid, keep the current frequency. Stop and outage frequency is 0.
33: emergency stop (snag signal)
Valid under closed loop vector control, speed regulator given 0, which makes the inverter fast stop in the maximum reverse torque.
34: forward deceleration
Valid under the forward running conditions, target frequency 0Hz, the inverter decelerates to 0Hz.
35: reverse deceleration
Valid under the reverse running conditions, target frequency 0Hz, the inverter decelerates to 0Hz.
36: forward stop
Valid under the forward running conditions, the inverter stops.
37: reverse stop
Valid under the reverse running conditions, the inverter stops.
38: frequency increase (hold)
When the signal is valid, target frequency continues to increase, until the amplitude limit; when the signal is invalid, keep the current frequency, the same to stop and outage.
39: frequency decrease (hold)
When the signal is valid, target frequency continues to decrease, until 0; when the signal is invalid, keep the current frequency, the same to stop and outage.
40: inching frequency selection
This signal is valid under multi-speed running conditions, target frequency is inching frequency.
41: command switching to operation panel
Valid in stop status, command channel switching to panel given.
42: command switching to terminal
Valid in stop status, command channel switching to panel given.
43: command switching to Modbus communication
Valid in stop status, command channel switching to Modbus given.
44: open loop main and auxiliary given switching
Valid signal, speed channel source switches to open loop auxiliary given, namely P10.03 speed channel selection switches to P50.00 given mode.
45: valid signal if PID main given switches to internal, process closed loop control main given channel switches to digital internal given, otherwise no switching.
46: valid signal if PID main given switches to analog A0, process closed loop control main given

channel switches to A0, otherwise no switching.

47: valid signal if PID auxiliary given switches to invalid, process closed loop control auxiliary given channel switches to invalid, otherwise no switching.

48: valid signal if PID auxiliary given switches to analog A0, process closed loop control auxiliary given channel switches to A0, otherwise no switching.

49: FJOG command. Valid signal for inching forward command, forward running takes inching frequency as target frequency. The inverter will stop if the signal is invalid.

50: FJOG command. Valid signal for inching reverse command, reverse running takes inching frequency as target frequency. The inverter will stop if the signal is invalid.

Inching running shares the highest priority.

51: Valid signal when PID main given switches to analog A1, process closed loop control main given channel switches to A1, otherwise no switching.

52: Valid signal when PID auxiliary given switches to analog A1, process closed loop control auxiliary given channel switches to A1, otherwise no switching.

53: speed given mode selection

Refer to the following table for its usage:

| Speed given mode selection | Speed given mode |
|---|---|
| OFF | P10.03 speed given mode 1 |
| ON | P10.07 speed given mode 2 |

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P30.07 | P1-P2 terminal input function selection | 0~63 | 0 |

PTC over temperature protection input terminal: default high level, which is reduced with over temperature signal

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P30.00 | Filtering times of terminals X0~X7 (times) | 0~100 | 5 |

Improve the anti-interfance ability of terminals by properly increasing P30.08. The longer their filering times, the longer the delay times of their actions.

## 7.6.2 Group P31 Digital Output Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P31.00 | Output K1 function definition | 0~63 | 2 |
| P31.01 | Output K2 function definition | 0~63 | 25 |
| P31.02 | Output K3 function definition | 0~63 | 0 |
| P31.03 | Output K4 function definition | 0~63 | 0 |
| P31.04 | Output K5 function definition | 0~63 | 0 |
| P31.05 | Output K6 function definition | 0~63 | 0 |

Y0 ~ Y1 terminal output can be defined as multifunctional digital output, also as high speed pulse output (function 19 and 20), K1 ~ K4 relay output also may be defined as multifunctional output, but not as pulse input.

Function definition list of multifunctional digital output:

| Function set | Meaning | Function set | Meaning |
|---|---|---|---|
| 0 | No-function | 1 | RDY |
| 2 | Inverter fault | 3 | Running signal (RUN) |
| 4 | Frequency arrive signal (FAR) | 5 | Consistent frequency and speed (FDT) |
| 6 | Inverter running at zero speed | 7 | DC bus voltage not less than 80% rated voltage |
| 8 | More than 5% rated current during running, while 10% when it stops | 9 | In self-tuning |
| 10 | Speed detection 1 | 11 | Speed detection 2 |
| 12 | Output 1 for fault forecast, normal output 0 | 13 | Spare |
| 14 | Zero servo torque direction output | 15 | Zero current detected |
| 16 | Generating and motoring status identification | 17 | Output contactor closing |
| 18 | Brake release | 19 | Pulse output DO0 |
| 20 | Pulse output DO1 | 21 | Radiator overheat alarm |
| 22 | Motor overheating alarm | 23 | Motor selection output |
| 24 | Encoder selection output | 25 | Brake output |
| 26 | Accumulated running time arrive | 27 | Single running time arrive |
| 28 | Output X1 | 29 | Output X2 |
| 30 | Stop undervoltage lockout | 31 | Fan control |
| 32 | Analog input disconnection | 33 | PTC alarm |
| 34 | In reverse | | |

**Note 1:** setting of P31.00 ~ P31.05 defines the functions of such 6 output ports as K1 ~ K2 and Y0 ~ Y3, whose range of value set and functions of the corresponding output port set for each value are shown as the following:

0: no-function

1 or 101: ready (RDY)

1: Normal self-check and no trouble, the related output point connected, otherwise disconnected;

101: Normal self-check and no trouble, the related output point disconnected, otherwise connected;

2 or 102: inverter fault

2: The inverter is in fault shutdown status, the related output point connected, otherwise disconnected;

102: The inverter is in fault shutdown status, the related output point disconnected, otherwise connected;

3 or 103: inverter running signal (RUN)

3: When the inverter is able to run normally responding to running command, the related output point connected, otherwise disconnected;

103: When the inverter is able to run normally responding to running command, the related

output point disconnected, otherwise connected;

6 or 106: In zero speed running

6: When output frequency is 0 during running, the related output point connected, otherwise disconnected;

106: When output frequency is 0 during running, the related output point disconnected, otherwise connected;

7 or 107: DC bus voltage not less than 85% rated value

7: When the inverter bus voltage isn't less than 85% rated value, the related output point connected, otherwise disconnected;

107: When the inverter bus voltage isn't less than 85% rated value, the related output point disconnected, otherwise connected;

8 or 108: more than 5% rated current during running, while 10% rated current during stop

8: if the above conditions are met, the related output point connected, otherwise disconnected;

108: if the above conditions are met, the related output point disconnected, otherwise connected;

9 or 109: in self-tuning

9: when the inverter is in self-tuning status, the related output point connected, otherwise disconnected;

109: when the inverter is in self-tuning status, the related output point disconnected, otherwise connected;

10 or 110: frequency detection 1

When the inverter output frequency reaches or exceeds any frequency detection (P31.22) plus frequency detection width (P31.23), frequency detection 1 is triggered; after the related output point takes action and the inverter frequency drops to any frequency detection (P31.22) again, frequency detection 1 resets.

10: when frequency detection 1 takes action, the related output point disconnected;

110: when frequency detection 1 takes action, the related output point connected;

11 or 111: frequency detection 2

When the inverter output frequency reaches or exceeds any frequency detection (P31.22), frequency detection 2 is triggered; after the inverter frequency drops to any frequency detection (P31.22) again minus frequency detection width (31.23), frequency detection 2 resets.

11: when frequency detection 2 takes action, the related output point connected;

111: when frequency detection 2 takes action, the related output point disconnected;

12 or 112: fault forecast

12: during fault forecast, the related output point connected, otherwise disconnected;

112: during fault forecast, the related output point disconnected, otherwise connected;

13 or 113: inverter alarm

13: when the inverter is in alarm status but not fault shutdown, the related output point connected, otherwise disconnected;

113: when the inverter is in alarm status but not fault shutdown, the related output point disconnected, otherwise connected;

14 or 114: zero servo torque direction judge (for the outage emergency leveling of the motor)

14: When the inverter measures heavy load and light counterweight, the related output point connected, otherwise disconnected;

114: When the inverter measures heavy load and light counterweight, the related output point disconnected, otherwise connected;

15 or 115: zero current detection

15: when output current exceeds zero current detection threshold (P31.20) during stop, the related output point connected, otherwise disconnected;

115: when output current exceeds zero current detection threshold (P31.20) during stop, the related output point disconnected, otherwise connected;

16: generating and motoring status identification 0: motoring; 1: generating

116: generating and motoring status identification 0: generating; 1: motoring

17: output contactor closing the contactor closes for output 1

It is used with function 21, to control the contactor to close before the inverter outputs any current

117: output contactor closing the contactor closes for output 0

18: brake release open the brake for output 1

It is used with functions 22 and 23, to control the external brake to open at the right time, and confirm the feedback point

118: brake release open the brake for output 0

19: pulse DO0 output (spare)

119: pulse DO0 output opposite to 19 level direction (spare)

20: pulse DO1 output (spare)

120: pulse DO1 output opposite to 20 level direction (spare)

21 or 121: greater than 90℃, overheat alarm

If the radiator temperature ≥80℃, the related output point connected, otherwise disconnected.

22: motor overheat alarm output

23: motor switching output

Motor selection output, the related output point disconnected: motor 1, the related output point connected: motor 2

24: encoder switching output

Encoder selection output, the related output point disconnected: encoder 1;

Related output point connected: encoder 2

25: hoisting brake output

Brake opens, output point connected; brake closes, output point disconnected.

26: accumulated running time arrive

Accumulated running time of the inverter exceeds the time set in P31.25, output terminal connected, other disconnected;

27: set continuous running time arrive

Single continuous running time of the inverter exceeds the time set in P31.24, output terminal connected, other disconnected;

28: output X1

Output the level status of input terminal X1 via output terminal

29: output X2

Output the level status of input terminal X2 via output terminal

30: Under-voltage block stop, system under-voltage, effective level output of the output terminal

31: Fan control, the inverter is in running or overheating, the output terminal connected, otherwise disconnected after a minute delay

32: Analog input disconnection

33: PTC alarm

0~10V input type of analog A0 and A1 channel connects to motor PTC signal, P32.01 and P32.07 are set as 6, P32.04 and P32.10 filtering time is set as 2000ms, protection threshold P23.01, if motor PTC signal is greater than P23.01 and lasted for 2s, 52# fault will be sent.

34: in reverse

Note: "connected" above mentioned means: for the relay output, the normally open contacts (1B and 1C, 2B and 2C) connected, while the normally closed contacts (1B and 1A, 2B and 2A) disconnected; for the collector open circuit output, it means the output point is in low level status. Similarly, "not connected" above mentioned means: for the relay output, the normally open contacts (1B and 1C, 2B and 2C) disconnected, while the normally closed contacts (1B and 1A, 2B and 2A) connected; for the collector open circuit output, it means the output point is in high resistance status.

**Note 2:** P31.04=3 for default set, appointing port Y0 as running signal (RUN) output port; P31.05=2, appointing port Y1 as the inverter fault signal output port.

**Note 3:** running (RUN) signal given

When the inverter receives up/down direction command signal and no base lockout is provided, running signal (RUN) only can be given.

**Note 4:** time sequence of fault signal

Output the fault signal when the inverter has any fault. At the same time, running signal is cleared. Fault signal is latched, which will be eliminated via the external input reset signal, reset operation of the manipulator, or outage, or delay time internally set.

Time sequence of fault signal is shown as Figure 7-15.


**Figure 7-15 Time sequence of fault signal**

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P31.06 | Output K1 action delay (s) | 0.0~60.0 | 0.0 |
| P31.07 | Output K1 reset delay (s) | 0.0~60.0 | 0.0 |
| P31.08 | Output K2 action delay (s) | 0.0~60.0 | 0.0 |
| P31.09 | Output K2 reset delay (s) | 0.0~60.0 | 0.0 |
| P31.10 | Output K3 action delay (s) | 0.0~60.0 | 0.0 |
| P31.11 | Output K3 reset delay (s) | 0.0~60.0 | 0.0 |
| P31.12 | Output K4 action delay (s) | 0.0~60.0 | 0.0 |
| P31.13 | Output K4 reset delay (s) | 0.0~60.0 | 0.0 |
| P31.14 | Output Y0 action delay (s) | 0.0~60.0 | 0.0 |
| P31.15 | Output Y0 reset delay (s) | 0.0~60.0 | 0.0 |
| P31.16 | Output Y1 action delay (s) | 0.0~60.0 | 0.0 |
| P31.17 | Output Y1 reset delay (s) | 0.0~60.0 | 0.0 |

Setting of signal output delay and reset delay at output end

P31.06 ~ P31.17 are time constant to set action delay and reset delay for such 6 signals as K1 ~ K4 and Y0 ~ Y1 at output end. By these parameters, delay time of the actual signal corresponding to output status at each output end can be set as required. And delay time will be set respectively for delay of the above output status whether in signal triggering or signal reset.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P31.20 | Zero current detection threshold (%) | 0.0~50.0 | 4.0 |

Zero current detection threshold of the inverter

This function is used for load change detection, set output terminal function as "15: zero current detected", and output the indicator signal after the inverter output current is below zero current detection width P31.20.

When the inverter current exceeds the threshold during stop, the related output end set by function code 15 (or 115) takes action.

**Note:** the function parameter is percentage of the inverter output current to the motor rated current.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P31.21 | Frequency consistence detection width (Hz) | 0.00~300.00 | 1.00 |
| P31.22 | Any frequency detection speed (Hz) | 0.00~300.00 | 1.00 |
| P31.23 | Any frequency detection width (Hz) | 0.00~300.00 | 0.20 |

P31.21 This function is used for deviation detection between output frequency and set frequency, set output terminal function as "4: frequency arrive signal", when the deviation between the inverter output frequency and set frequency is in the set range of the function code, outputs the indicator signal, shown as the figure, frequency arrive signal FAR.

Yi represents terminals Y0-Y1 or relay terminals K1-K4.

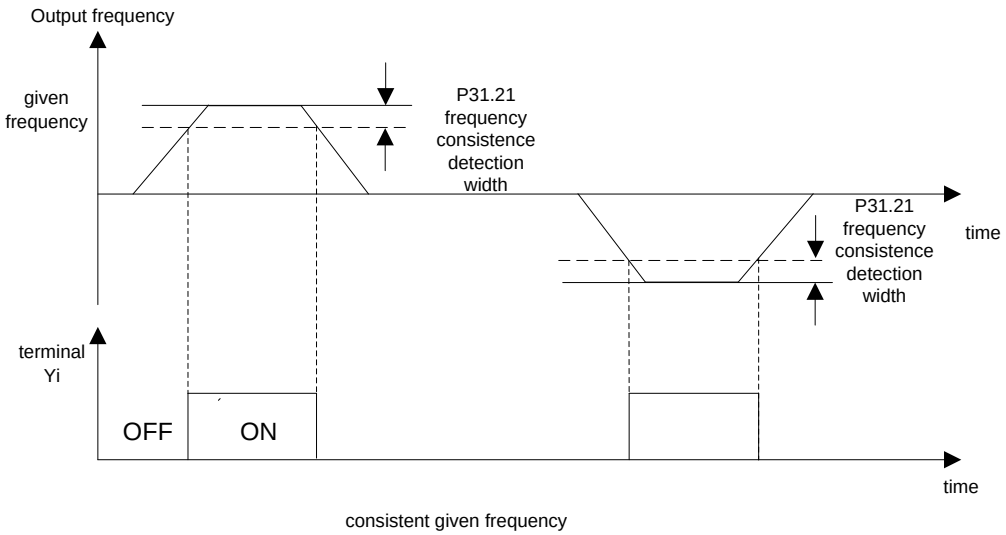



**Figure 7-16 Frequency consistence detection 1**

P31.22 and P31.23 are two parameters for any frequency detection: any frequency detection width and any frequency detection width, whose combination is used for frequency/speed

consistency, frequency detection 1 and frequency detection 2, to measure whether the inverter output frequency is in a specified frequency range. In frequency detection 1, when the inverter output frequency reaches or exceeds frequency detection speed (P31.22) + frequency detection width (P31.23), frequency detection 1 is triggered; after the related output point takes action and the inverter output frequency drops to frequency detection speed (P31.22), frequency detection 1 resets. Frequency detection 1 is negative logic, whose corresponding output status is OFF during triggering, while ON during reset.

In frequency detection 2, when the inverter output frequency reaches or exceeds frequency detection speed (P31.22), frequency detection 2 is triggered; after the related output point takes action and the inverter output frequency drops to frequency detection speed (P31.22) - frequency detection width (P31.23), frequency detection 2 resets. Frequency detection 2 is positive logic, whose corresponding output status is ON during triggering, while OFF during reset.

Set output terminal function as "5: frequency/speed consistency", shown as the following:

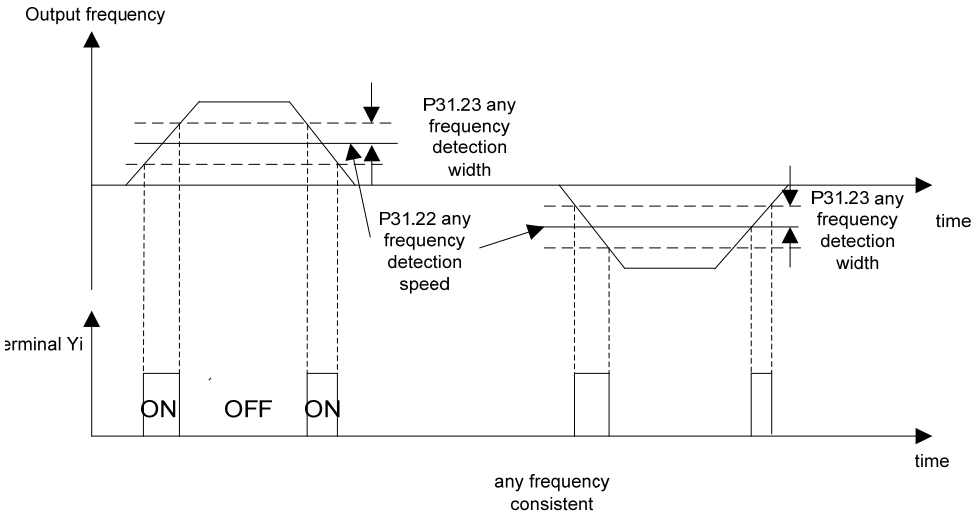



**Figure 7-17 Frequency consistency detection 2**

Set output terminal function as "10: speed detection 1", shown as the figure.

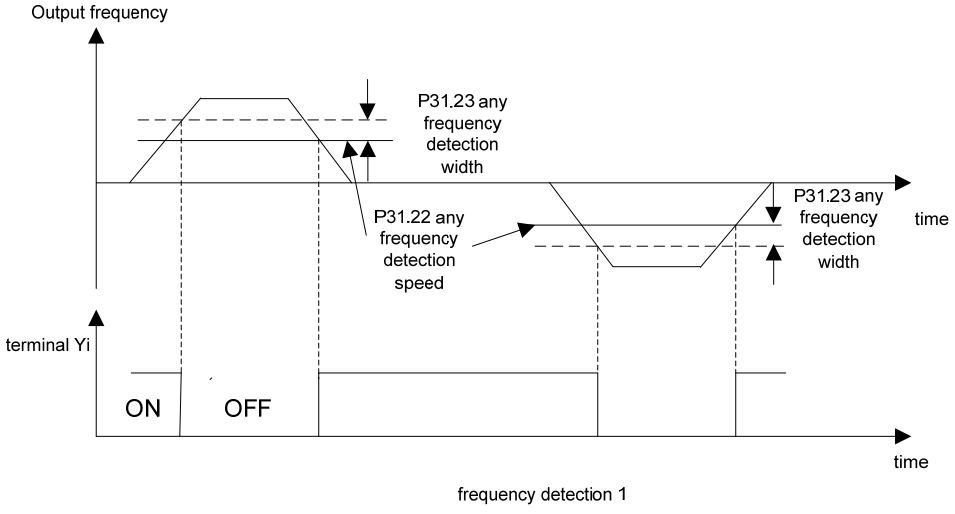



**Figure 7-18 Speed detection 1**

Set output terminal function as "11: speed detection 2", shown as the figure.

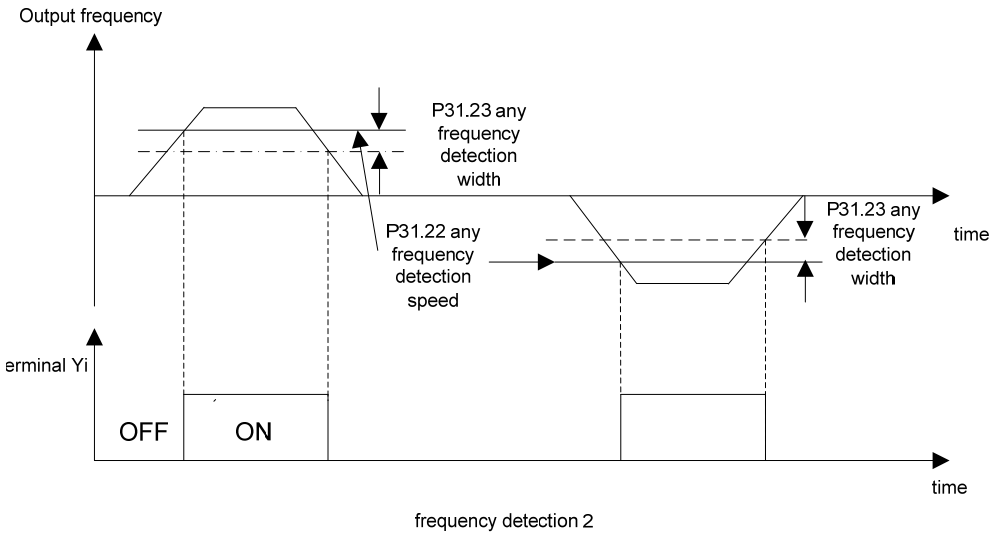



**Figure 7-19 Speed detection 2**

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P31.24 | Continuous running time arrive (h) | 0~65535 | 2 |

Input the indicator signal after single continuous running time of the inverter arrives P31.24 from running command. Realize output indicator signal by defining the output terminal function code 27.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P31.25 | Accumulated running time arrive (h) | 0~65535 | 8 |

Output the indicator signal after accumulated running time of the inverter arrives P31.25 from electrification. Realize output indicator signal by defining the output terminal function code 26.

### 7.6.3 Group P32 Analog Input Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P32.00 | A0 input type | 0~3 | 1 |
| P32.06 | A1 input type | 0~3 | 1 |

Need to set analog input type parameters:

Voltage input A0 and A1: 0: 0 ~ 10V; 1: -10V ~ 10V;

Current input: 2: 0~20mA; 3: 4~20mA.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P32.01 | A0 input function selection | 0~6 | 0 |
| P32.07 | A1 input function selection | 0~6 | 0 |

P32.01, P32.07 set input function for analog AI:

0: no-function

1: target speed signal

2: current speed signal

3: torque signal

4: compensation torque signal

When frequency given mode P10.03=3, 5, 7, A0 and A1 will be automatically set as 1

When frequency given mode P10.03=4, 6, 8, A0 and A1 will be automatically set as 2

When torque given mode P10.04=1, 2, 3, A0 and A1 will be automatically set as 3

When compensation torque given mode P10.05=2, 3, 4, A0 and A1 will be automatically set as 4.

5: speed limit signal

6: motor PTC signal

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P32.02 | A0 offset(V) | 0.000~20.000 | 10.000 |
| P32.03 | A0 gain(%) | 0.1~1000.0 | 100.0 |
| P32.04 | A0 filtering time (ms) | 0~65535 | 10 |
| P32.05 | A0amplitude limit (V) | 0.000~20.000 | 10.000 |
| P32.08 | A1offset (V) | 0.000~10.000 | 10.000 |
| P32.09 | A1 gain (%) | 0.1~1000.0 | 100.0 |
| P32.10 | A1filtering time (ms) | 0~65535 | 10 |
| P32.11 | A1 amplitude limit(V) | 0.000~10.000 | 10.000 |

P32.02 ~ P32.05 and P32.08 ~ P32.11 are used to set offset, gain, filtering time and amplitude limit for two analog input ports separately.

**Offset** concludes: voltage type: 0.000 offset-10.000V; 10.000 offset 0V; 20.000 offset +10.000V,

**Gain** is a proportionality coefficient, it is 100% typically.

Proper adjustment of **filterring time** can improve anti-interference ability of terminal input, because analog input via A0 and A1 is provided with interferance signal in field applications, yet the longer the filtering time of the terminal, the longer its response delay.

**Amplitude limit** is only to limit the analog input final processing signal within a scope with certain control need, for current type, it needs to change amplitude limit as 20.000mA.

Actual input = analog input * gain + offset

Example 1: analog input 0~10V is speed given, whose actual corresponding input power is 0-the maximum motor frequency P20.13, need to set gain 100% and offset 10.000V

Example 2: analog input 1~10V is speed given, whose actual corresponding input frequency is 0-the maximum motor frequency P20.13, need to set gain 100% and offset 9.000V

### 7.6.4 Group P33 Analog Output Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P33.00 | M0 output function selection | 0~16 | 1 |
| P33.03 | M1 output function selection | 0~16 | 2 |

Analog DAC monitoring digital output 0-1000 represents 0-10.00V

Function definition list of multi-function analog output (partial common monitoring data):

| Function set | Definition | Corresponding relation |
|---|---|---|
| 0 | No-function | |
| 1 | Output current | 0~Ie corresponding to 0~10V |

| Function set | Definition | Corresponding relation |
|---|---|---|
| 2 | Output voltage | 0~Ue corresponding to 0~10V |
| 3 | Torque given | 0~Te corresponding to 0~10V |
| 4 | Bus voltage | 0~Udc corresponding to 0~10V |
| 5 | Output total power | 0~P corresponding to 0~10V |
| 6 | Output active power | 0~Pe corresponding to 0~10V |
| 7 | Current speed (no sign) | 0~Ne corresponding to 0~10V |
| 8 | Speed given (with sign) | 0~Ne corresponding to 0~10V |
| 9 | Speed feedback (with sign) | 0~Ne corresponding to 0~10V |
| 10 | Acceleration | 0~50Hz/s corresponding to 0~10V |
| 11 | Radiator temperature | 0~100℃ corresponding to 0~10V |
| 12 | Analog A0 | 0~10V corresponding to output 0~10V |
| 13 | Analog A1 input | 0~10V corresponding to output 0~10V |
| 14 | Analog A2 (spare) | 0~10V corresponding to 0~10V |
| 15 | ModBus analog output 0 | 0~10000 corresponding to 0~10V |
| 16 | ModBus analog output 1 | 0~10000 corresponding to 0~10V |

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P33.01 | M0 offset (V) | 0.00~20.00 | 15.00 |
| P33.02 | M0 gain (%) | 0.1~6000.0 | 100.0 |
| P33.04 | M1 offset (V) | 0.00~20.00 | 15.00 |
| P33.05 | M1 gain (%) | 0.1~6000.0 | 100.0 |

This function can be used to adjust the analog output defined in the above table. Analog after adjustment is the actual output of terminal M.

Differing from other function code, adjustment of the above parameters will exert real-time influence on M output.

Output correction mode of M0 and M1 is the same.

Actual output = M output * gain + offset

Actual output voltage range -10V~10V

When the parameters have been set:

Example 1: output is frequency 0~50.00Hz (rated frequency)

Set the gain as 100% and the offset as 15.000V

Actual output voltage is 0V for 0Hz, 5V for 50.00Hz

Example 2: output is frequency 0~50.00Hz (rated frequency)

Set the gain as 200% and the offset as 15.000V

Actual output voltage is 0V for 0Hz, 10V for 50.00Hz

Example 3: output is output current 0~2Ie (rated current)

Set the gain as 50% and the offset as 15.000V

Actual output voltage is 0V for 0A , 2Ie for 5V.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P33.06 | M0 analog output type | 0~4 | 0 |
| P33.07 | M1 analog output type | 0~4 | 0 |

P33.06 and P33.07 are used to select analog output type:

0: no selection; 1: 0~10V; 2: -10V~10V; 3: 0~20mA; 4: 4~20mA.

Automatically set the corresponding analog output offset and gain, as well as default corresponding output 0-rated current/speed, etc. after type selection;

1: 0~10V default: offset 15.000 gain 200.0%

2: -10V~10V default: offset 15.000 gain 200.0%

3: 0~20mA default: offset 10.500 gain 385.0%

4: 4~20mA default: offset 12.150 gain 312.0%

## 7.7 Group P4X Speed Parameter Groups

### 7.7.1 Group P40 Basic Speed Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P40.00 | Panel speed | 0.0~300.0 | 5.0 |

Panel given starting speed can be changed with button.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P40.01 | Basic frequency | 0.0~300.0 | 50.0 |

Basic running frequency is the corresponding minimum frequency when the inverter outputs the maximum voltage. When the standard AC motor is applied, it corresponds to the motor rated frequency, refer to the motor nameplate.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P40.02 | Acceleration time 0 (s) | 0.10~360.00 | 5.00 |
| P40.03 | Deceleration time 0 (s) | 0.10~360.00 | 5.00 |

The function sets the frequency from accelerated running to constant speed or from constant decelerated running to stop after the inverter starts to run.

Acceleration time 0: the time P40.02 of the inverter output frequency increasing from zero frequency to the maximum frequency

Deceleration time 0: the time P40.03 of the inverter output frequency decreasing from the maximum frequency to zero frequency

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P40.04 | Acceleration time 1 (s) | 0.10~360.00 | 5.00 |
| P40.05 | Deceleration time 1 (s) | 0.10~360.00 | 5.00 |
| P40.06 | Acceleration time 2 (s) | 0.10~360.00 | 5.00 |
| P40.07 | Deceleration time 2 (s) | 0.10~360.00 | 5.00 |
| P40.08 | Acceleration time 3 (s) | 0.10~360.00 | 5.00 |
| P40.09 | Deceleration time 3 (s) | 0.10~360.00 | 5.00 |

Besides the acceleration time 0 (P40.2) and deceleration time 0 (40.03) defined above, additional 3 groups of acceleration time and deceleration time (acceleration time 1 and deceleration time 1, acceleration time 2 and deceleration time 2, acceleration time 3 and deceleration time 3) can be defined, to select the different acceleration and deceleration in different terminal status by means of defining the multifunctional terminal X (acceleration and deceleration time selection function 1 ~ 2). Meaning of these 3 groups of acceleration time and deceleration time is the same as P40.02 and P40.03.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P40.10 | Acceleration circular arc 0 (s) | 0.00~10.00 | 0.00 |
| P40.11 | Acceleration circular arc 1 (s) | 0.00~10.00 | 0.00 |
| P40.12 | Deceleration circular arc 0 (s) | 0.00~10.00 | 0.00 |
| P40.13 | Deceleration circular arc 1 (s) | 0.00~10.00 | 0.00 |

Acceleration and deceleration circular arc: to improve the time P40.10-P40.13 of arc segment increased due to smoothness of starting and terminate section during acceleration and deceleration. Segmental arc curve time applies to the conveyor belt transporting fragile goods or the applications requiring smooth speed control.

P40.10 ~ P40.13 are to set S curve (speed curve) during motor running under switching multi-speed given, they specify the acceleration time (P40.02), deceleration time (P40.03), acceleration circular arc time (P40.10 and P40.11) and deceleration circular arc time (P40.12 and P40.13), which directly affect the characteristics of S curve, therefore directly relating to the motor running efficiency and seating comfort. Specific position of the above parameters in motor running S speed curve is shown as Figure 7-20.

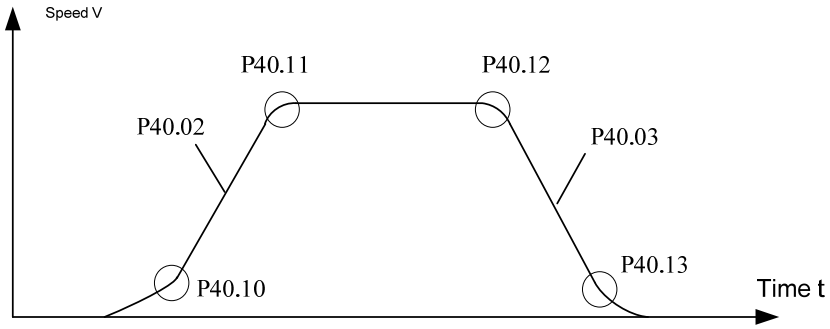



**Figure 7-20 Position of S curve in motor running**

## 7.7.2 Group P41 Digital Multi-speed Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P41.00 | Digital multi-speed given 0(Hz) | 0.00~300.00 | 0.00 |
| P41.01 | Digital multi-speed given 1(Hz) | 0.00~300.00 | 5.00 |
| P41.02 | Digital multi-speed given 2(Hz) | 0.00~300.00 | 10.00 |
| P41.03 | Digital multi-speed given 3(Hz) | 0.00~300.00 | 20.00 |
| P41.04 | Digital multi-speed given 4(Hz) | 0.00~300.00 | 30.00 |
| P41.05 | Digital multi-speed given 5(Hz) | 0.00~300.00 | 40.00 |

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P41.06 | Digital multi-speed given 6(Hz) | 0.00~300.00 | 50.00 |
| P41.07 | Digital multi-speed given 7(Hz) | 0.00~300.00 | 60.00 |
| P41.08 | Digital multi-speed given 8(Hz) | 0.00~300.00 | 0.00 |
| P41.09 | Digital multi-speed given 9(Hz) | 0.00~300.00 | 0.00 |
| P41.10 | Digital multi-speed given 10(Hz) | 0.00~300.00 | 0.00 |
| P41.11 | Digital multi-speed given 11(Hz) | 0.00~300.00 | 0.00 |
| P41.12 | Digital multi-speed given 12(Hz) | 0.00~300.00 | 0.00 |
| P41.13 | Digital multi-speed given 13(Hz) | 0.00~300.00 | 0.00 |
| P41.14 | Digital multi-speed given 14(Hz) | 0.00~300.00 | 0.00 |
| P41.15 | Digital multi-speed given 15(Hz) | 0.00~300.00 | 0.00 |

They can be considered as process open loop frequency given, to select different multistage frequency given in different terminal status by defining the multifunctional terminal X (digital multistage 0 ~ 3). ON means the valid terminal, OFF means the invalid terminal.

Note: during process open loop running, if input terminal function sets analog and digital multistage simultaneously, then the digital multistage shares high priority.

P41.00 ~ P41.15 respectively defines the speed command value of digital multi-speed given 1 ~ 15. Four input point binary system codes of switching multi-speed given 0 ~ 3 combine 16 kinds of status, which are corresponding to the above 15 given speed commands from P41.00 to P41.15 and 0 given speed (combination code=0) . Corresponding relation between multi-speed input port signal and given speed given is shown as Table 6.2.

**Table 6.2 Corresponding relation between multi-speed input port combination and given speed**

| Multi-speed combination code | Multi-speed given 3 | Multi-speed given 2 | Multi-speed given 1 | Multi-speed given 0 | Given speed |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | Given speed 0 |
| 1 | 0 | 0 | 0 | 1 | Given speed 1 |
| 2 | 0 | 0 | 1 | 0 | Given speed 2 |
| 3 | 0 | 0 | 1 | 1 | Given speed 3 |
| 4 | 0 | 1 | 0 | 0 | Given speed 4 |
| 5 | 0 | 1 | 0 | 1 | Given speed 5 |
| 6 | 0 | 1 | 1 | 0 | Given speed 6 |
| 7 | 0 | 1 | 1 | 1 | Given speed 7 |
| 8 | 1 | 0 | 0 | 0 | Given speed 8 |
| 9 | 1 | 0 | 0 | 1 | Given speed 9 |
| 10 | 1 | 0 | 1 | 0 | Given speed 10 |
| 11 | 1 | 0 | 1 | 1 | Given speed 11 |
| 12 | 1 | 1 | 0 | 0 | Given speed 12 |
| 13 | 1 | 1 | 0 | 1 | Given speed 13 |
| 14 | 1 | 1 | 1 | 0 | Given speed 14 |
| 15 | 1 | 1 | 1 | 1 | Given speed 15 |

In the table, status 0 shows no signal at input port; status 1 shows input signal at input port. Further explanation with an example: if speed given 0 has input signal, speed given 1 has input signal, speed given 2 has no input signal and speed given 3 has no input signal, then binary coding will be "0011"＝3, whose corresponding given speed is given speed 3, and its given speed value will be appointed by P41.03.

| Function code | Name | Setting range | Default value |
|---|---|---|---|
| P41.16 | Inching frequency given (Hz) | 0.00~50.00 | 5.00 |

Frequency set value set by inching operation.

## 7.8 Group P5X Process Control Parameter Groups

### 7.8.1 Group P50 Process Open Loop Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P50.00 | Open loop auxiliary given mode | 0~5 | 0 |

Select process open loop auxiliary given mode P50.00 as following:

0: nil; 1: A0; 2: A1; 3: spare; 4: spare; 5: PID given target speed

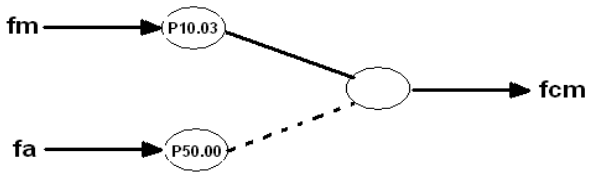



**Figure 7-21 Schematic of open loop auxiliary given**

P10.03 main given value $f_m$ gives $f_c$, input 44 via the digital: open loop main and auxiliary given are switched to auxiliary given value, the main given value fm is switched to auxiliary given value $f_a$.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P50.01 | Open loop given main and auxiliary relation calculation | 0~6 | 0 |

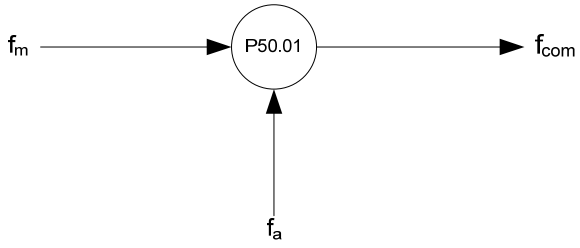



**Figure 7-22 Schematic of open loop main and auxiliary given combination**

Under the process open loop control mode, an auxiliary given value $f_a$ is overlaid on the main given value $f_m$, to generate process open loop combination frequency given $f_{com}=f_m+f_a$.

Main given value $f_m$ and auxiliary given value $f_a$ are able to have addition, subtraction, offset, maximization and minimization calculation.

Process loop given main and auxiliary relation calculation P50.01 is defined as follows:

0: no calculation

1: main given + auxiliary given: auxiliary frequency given value is overlaid on the main given, with the function “plus”。

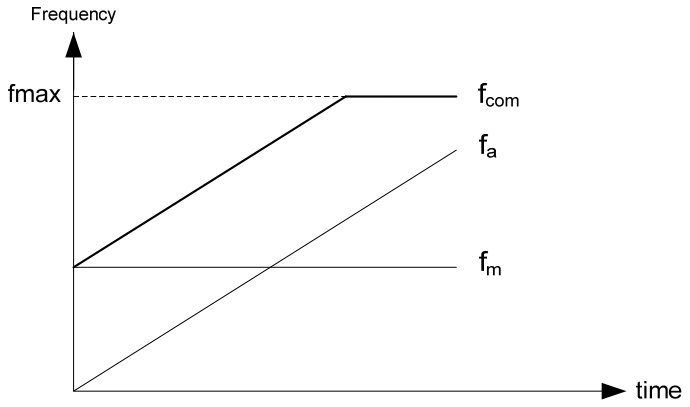



**Figure 7-23 Open loop main and auxiliary given calculation 0**

Process open lop combination given fcom=main given fm+auxiliary given fa

2: Main given-auxiliary given: auxiliary frequency given value is overlaid on the main given, with the function “minus”.

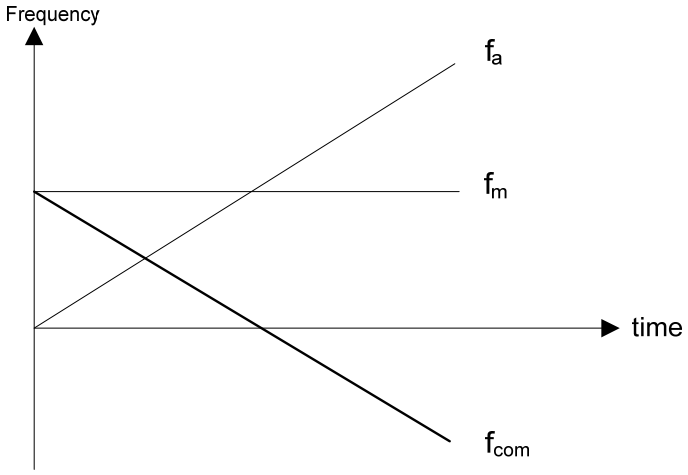



**Figure 7-24 Open loop main and auxiliary given calculation 1**

Process open loop combination given $f_{com}$=main given $f_m$-auxiliary given $f_a$

3: spare. 4: spare.

5: maximization: take the maximum value from the main given $f_m$ and auxiliary given $f_a$.

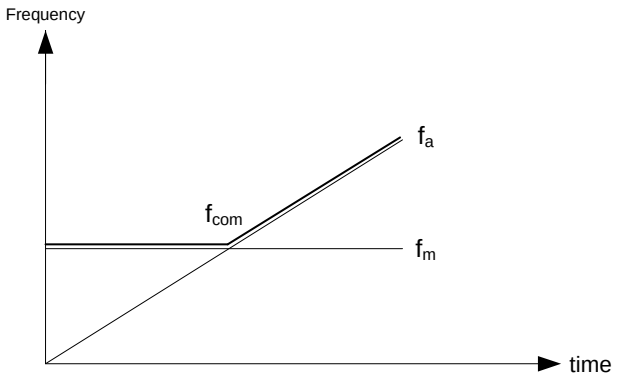



**Figure 7-25 Open loop main and auxiliary given calculation 4**

Process open loop combination given $f_{com}$=Max{main given $f_m$ , auxiliary given $f_a$}

6: Minimization: take the minimum value from the main given $f_m$ and auxiliary given $f_a$.

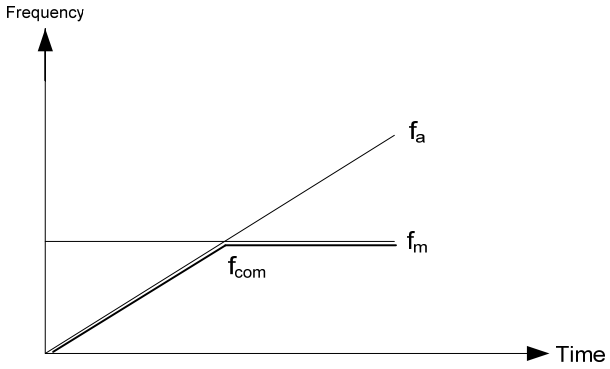



**Figure 7-26 Open loop main and auxiliary given calculation 5**

Process open loop combination given $f_{com}$=Min{ main given $f_m$ , auxiliary given $f_a$}

**Note:** when the frequency corresponding to the resultant $f_{com}$ exceeds the upper and lower frequency limit, output frequency is limited to the upper and lower limit.

## 7.8.2 Group P51 Process Close Loop Parameters

PID control is a common method for process control, to have proportional calculation, integral calculation and differential calculation for the feedback signal of controlled variable and the deviation of target signal, so as to adjust the inverter frequency and form negative feedback system, making the controlled volume to be more than the target volume. This method applies to flow control, pressure control and temperature control. The basic control functional block diagram is shown as:

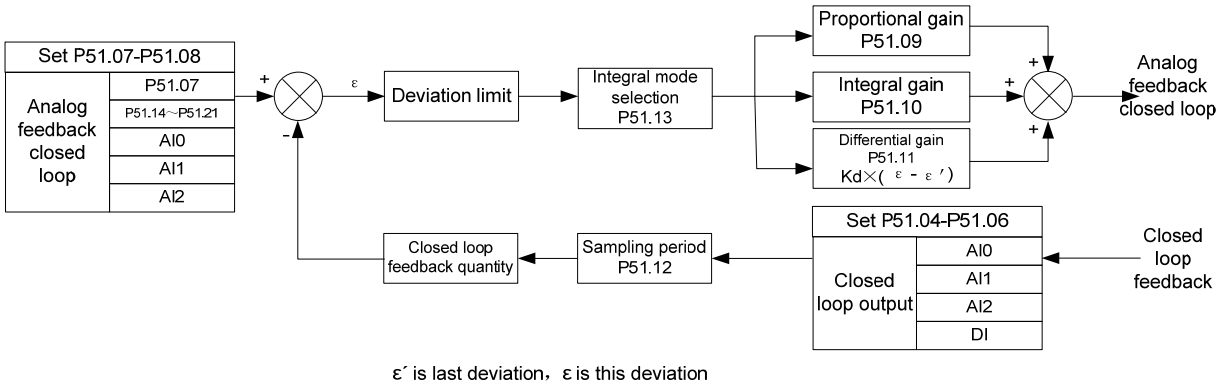



**Figure 7-27 PID functional block diagram**

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P51.00 | Closed loop run control selection | 0~1 | 0 |

Closed loop running control selection

0: invalid

1: valid

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P51.01 | Closed loop control main given mode | 0~6 | 0 |

| | | | |
|---|---|---|---|
| P51.02 | Closed loop control auxiliary given mode | 0~6 | 2 |
| P51.03 | Closed loop given main and auxiliary calculation | 0~6 | 0 |

In the closed loop system with feedback, if main and auxiliary given are available, the main given value may be internal given, analog and communication; and the auxiliary given value may be analog and communication.

P51.01 closed loop control main given mode selection is shown as:

0: internal given (P51.07); 1: A0; 2: A1; 3: spare; 4: spare; 5: spare; 6: Modbus communication

P51.02 closed loop control auxiliary given mode selection is shown as:

0: nil; 1: A0; 2: A1; 3: spare; 4: spare; 5: spare; 6: Modbus communication given;

P51.03 closed loop control given main and auxiliary calculation selection is shown as:

0: no calculation; 1: main+auxiliary; 2: main-auxiliary; 3: spare; 4: spare; 5: take the maximum value; 6: take the minimum value

Closed loop given main and auxiliary function is the same as open loop given main and auxiliary calculation function, see details of P50.01.

Note: closed control analog main given, auxiliary given, main feedback and auxiliary feedback can't be set as the same channel.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P51.04 | Closed loop control main feedback mode | 0~6 | 1 |
| P51.05 | Closed loop control auxiliary feedback mode | 0~6 | 2 |
| P51.06 | Closed loop control feedback main and auxiliary calculation | 0~6 | 0 |

In the closed loop system with feedback, the main and auxiliary feedback may be analog or pulse quantity. Process closed loop feedback main and auxiliary calculation function is the same as that of closed loop and process open loop given, see the details of P50.01.

P51.04: closed loop control main feedback mode selection is shown as:

0: nil; 1: A0; 2: A1; 3: spare; 4: spare; 5: spare; 6: Modbus communication given;

P51.05: closed loop control auxiliary feedback mode selection is shown as:

0: nil; A0; 2: A1; 3: spare; 4: spare; 5: spare; 6: Modbus communication given;

P51.06 closed loop control feedback main and auxiliary calculation selection is shown as:

0: no calculation; 1: main +auxiliary; 2: main-auxiliary; 3: spare; 4: spare; 5: take the maximum value; 6: take the minimum value

Note: closed control analog main given, auxiliary given, main feedback and auxiliary feedback can't be set as the same channel.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P51.07 | PID internal given value | 0.00~10.00 | 0.70 |
| P51.08 | Unit | 0~3 | 0 |

Before determine the process closed loop given quantity, firstly the current control running mode P51.00=1 shall be determined firstly. When the current control running mode is analog feedback process closed loop, if P51.00 is set as 0, then the closed loop given quantity is determined by P51.07.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P51.09 | Proportional gain Kp | 0.000~10.000 | 0.500 |
| P51.10 | Integral gain Ki | 0.000~10.000 | 0.500 |
| P51.11 | Differential gain Kd | 0.000~10.000 | 0.000 |

The bigger the Kp, the faster the response, but oscillation may be caused if it is too big. Kp isn't able to eliminate the deviation completely, Ki may be adopted to eliminate the residual deviation; the bigger the Ki, the faster response to the deviation of the inverter, but oscillation may be caused if it is too big. If hopping feedback appears in system, Kd is required, which is able to rapidly response to the system feedback and given deviation change. The bigger the Kd, the faster the response, but oscillation may be caused if it is too big. On-line modification and E2ron operation will be executed.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P51.13 | Integral selection mode | 0~1 | 0 |

The function determines the specific operation mode during process closed loop regulation.

If output of the process closed loop regulation reaches upper or lower frequency limit (P70.00 or P70.01), two actions for selection are available in integration element.

0: Stop integral regulation if frequency reaches the upper or lower limit; integral quantity keeps unchanged, if the trend between given quantity and feedback quantity changes, integral quantity will change rapidly with this trend.

1: Continue integral regulation if frequency reaches the upper or lower limit; integral quantity makes real-time response to the change between given quantity and feedback quantity, unless the internal integral limit has been reached. When the trend between given quantity and feedback quantity changes, more time is needed to offset the influence of continued integral, therefore the integral quantity is able to follow change of the trend.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P51.21 | Internal multi-stage given 7 (V) | 0.00~10.00 | 10.00 |
| P51.22 | Integral action upper limit (%) | 0~ | 100.00 |
| P51.24 | Closed loop input upper limit (%) | 0~ | 50.0 |
| P51.25 | Closed loop input lower limit (%) | 0.0~20.0 | 0.0 |
| P51.26 | Closed loop output upper limit (%) | 0.0~ | 100.0 |

P51.22 is used with P51.13, when P51.13=1, limit value set by P51.22 shall be valid.

P51.23 closed loop output reverse selection: spare

P51.24 ~ P51.26 set limit value in process closed loop control, regulate it according to the upper limit if it exceeds P51.24, while no PID regulation is made if it is below the lower limit, set the limit value in process closed loop control.

P51.27 closed loop output lower limit: spare.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P51.28 | Sleep selection | 0~1 | 0 |
| P51.29 | Sleep frequency(Hz) | 0.00~50.00 | 30.00 |
| P51.30 | Sleep delay(s) | 0.00~655.35 | 10.00 |
| P51.31 | Wake up deviation(%) | 0.00~100.00 | 0.10 |
| P51.32 | Wake up delay(s) | 0~3600.0 | 10.0 |

Sleep parameters:

P51.28 sleep selection: 0 invalid; 1 valid

When sleep selection is valid, set sleep frequency, sleep delay, wake up deviation and wake up delay.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P51.33 | Given acceleration and deceleration time | 0.0~50.0 | 0.0 |
| P51.34 | Closed loop output filtering time | 0.00~50.000 | 0.01 |

When the closed loop given changes suddenly, regulate these two parameters to make the given control within a certain response time, so as to make the response to the closed loop process in some environment more smoothly.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P51.35 | Minimum given quantity | 0.0~100.0 | 0.0 |
| P51.36 | Feedback quantity corresponding to minimum given quantity | 0.0~100.0 | 0.0 |
| P51.37 | Maximum given quantity | 0.0~100.0 | 10.0 |
| P51.38 | Feedback quantity corresponding to maximum given quantity | 0.0~100.0 | 10.0 |

P51.35 ~ P51.38 define the relation curve of analog closed loop given and expected feedback quantity, whose set value will be the percentage of the actual given and feedback quantity to the reference value (10V or 20mA).

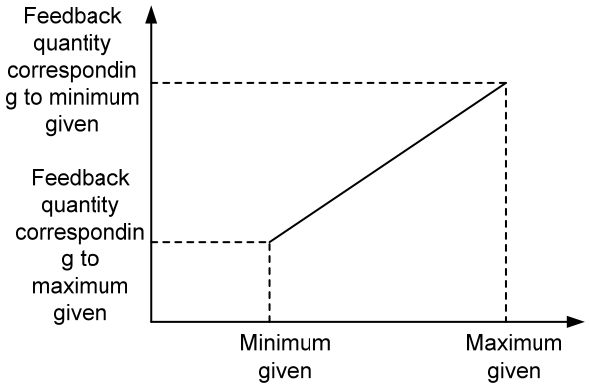



**Figure 7-28 Feedback positive regulation**

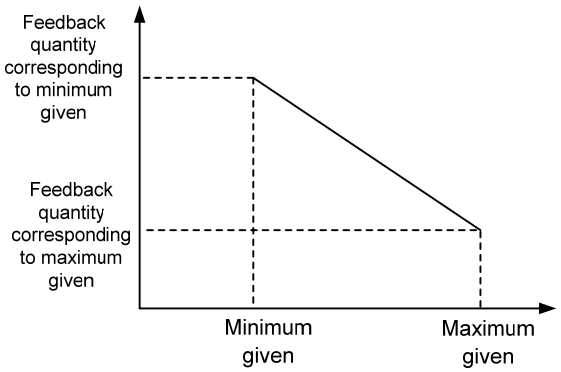



**Figure 7-29 Feedback negative regulation**

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P51.39 | Preset frequency (Hz) | 0.001~ maximum frequency | 22.0 |
| P51.40 | Preset frequency holding time (s) | 0~60 | 0 |

After closed loop operation starts, the frequency firstly will be accelerated to closed loop preset frequency P51.38 according to acceleration time, then run as per the closed loop characteristics after continuously having run a period of time at this frequency point. If closed loop preset frequency function isn't required, preset frequency and holding time both can be set as 0.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P51.41 | Deviation negation | 0~1 | 0 |

Whether negate the comparative result from the feedback signal and the set value or not, 0: no negation; 1: deviation negation.

## 7.9 Group P6X Vector Control Parameter Groups

### 7.9.1 Group P60 Speed Control Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P60.00 | Speed loop zero speed P | 0.00~655.35 | 0.00 |
| P60.01 | Speed loop zero speed I | 0.00~655.35 | 0.00 |
| P60.02 | Speed loop zero speed D | 0.00~655.35 | 0.00 |
| P60.03 | Speed loop low speed P | 0.00~655.35 | 100.00 |
| P60.04 | Speed loop low speed I | 0.00~655.35 | 5.00 |
| P60.05 | Speed loop low speed D | 0.00~655.35 | 0.50 |
| P60.06 | Speed loop medium speed P | 0.00~655.35 | 70.00 |
| P60.07 | Speed loop medium speed I | 0.00~655.35 | 2.00 |
| P60.08 | Speed loop medium speed D | 0.00~655.35 | 0.20 |
| P60.09 | Speed loop high speed P | 0.00~655.35 | 70.00 |
| P60.10 | Speed loop high speed I | 0.00~655.35 | 2.00 |
| P60.11 | Speed loop high speed D | 0.00~655.35 | 0.10 |

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P60.12 | Switching frequency 0(%) | 0.0~6553.5 | 10.0 |
| P60.13 | Switching frequency 1(%) | 0.0~6553.5 | 60.0 |

PID regulation for speed loop, P0, I0 and D0 are taken as zero servo section regulation parameters, the rest 3 groups of parameters are divided into 3 groups by P60.12 and P60.13, P1, I1 and D1 are low speed section regulation parameters, P2, I2 and D2 are medium speed section regulation parameters, and P3, I3 and D3 are high speed section regulation parameters.

P60 parameter group mainly regulates the proportional gain and integral time of speed regulator.

**Proportional gain P:**

Make adjustment according to the mechanical rotational inertia connected to the motor. For the mechanical device with big rotational inertia, please increase P gain; for that with small rotational inertia, please decrease P gain.

When P gain is greater than inertia, although control response can be quicken, oscillation or overshoot may be caused to the motor; on the contrary, if P gain is less than inertia, control response becomes slow, the time for speed regulation to the steady value will be longer.

**Integral time I:**

When it is set as 0, indicating invalid integral (control P independently). Please set integral time I as non-zero value if deviation between the speed command and actual speed under the stable status is 0. When I is smaller, system response is fast, with oscillation if it is too small; while I is bigger, system response is slow.

**Derivative time D:**

generally it doesn't need to be regulated and is set according to the default. The parameter is able to quickly respond the change of system feedback and given deviation. The bigger the value, the faster the response, but oscillation may be caused if it is too big. It is valid if it is set as 0.

PID set value adjustment at high speed, medium speed and low speed:

When the motor speed is higher than switching frequency 01, P60.09 ~ P60.11 will work, making the system reach the good dynamic response without any oscillation; when the motor speed is lower than switching frequency 0, P60.03 ~ P60.05 will work. In order to realize better dynamic response at low speed, proportional gain P60.03 can be properly increased and integral time P60.04 can be reduced. When the speed is below switching frequency 1 and higher than switching frequency 0, P60.06 ~ P60.08 will work.

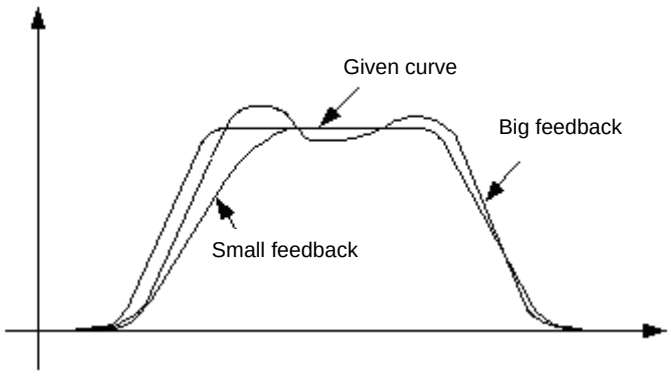



**Figure 7-33 Influence of proportional constant P on feedback track**

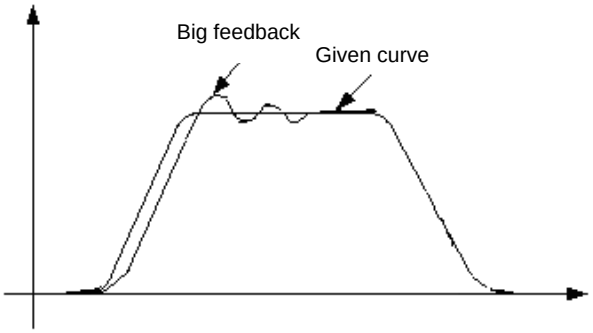



**Figure 7-34 Influence of integral constant I on feedback track**

### 7.9.2 Group P61 Current Control Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P61.00 | Current loop Kp | 0.01~9.99 | 1.40 |
| P61.01 | Current loop Ki | 0.01~9.99 | 1.00 |
| P61.02 | Current loop Kd | 0.00~9.99 | 0.00 |
| P61.03 | Current loop bandwidth (Hz) | 0.1~1000.0 | 400.0 |
| P61.04 | Magnetic link bandwidth (Hz) | 0.1~1000.0 | 0.8 |
| P61.05 | Current loop selection | 0~10 | 0 |
| P61.06 | V/F control current loop Max | 0.0~100.0 | 1.0 |
| P61.07 | V/F control current loop Min | 0.0~100.0 | 1.0 |

Group P61 mainly carries out PID regulatin for current loop, typically no regulation provides and set it according to the default.

### 7.9.3 Group P62 Torque Control Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P62.00 | Digital torque given (%) | 0.0~100.0 | 0.0 |
| P62.01 | Torque direction | 0~1 | 0 |
| P62.02 | Torque increase time (s) | 0.01~655.35 | 1.00 |
| P62.03 | Torque decrease time (s) | 0.01~655.35 | 1.00 |

When P10.00=2, the four parameters can be used:

When torque given mode P10.04=0, torque, direction, acceleraiton and deceleration time are determined by P62.00, P61.01, P62.02 and P62.03 respectively.

### 7.9.4 Group P63 Torque Compensation Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P63.00 | Compensation torque direction | 0~1 | 0 |
| P63.01 | Compensation gain (%) | 0.0~200.0 | 100.0 |
| P63.02 | Compensation offset (%) | 0.0~100.0 | 0.0 |
| P63.03 | Light load switch compensation (%) | 0.0~99.9 | 0.0 |

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P63.04 | Heavy load switch compensation (%) | 0.0~99.9 | 0.0 |

When P10.05 is set as nonzero, these 5 parameters can be used, to compensate the proportional and deviation calcuatlion according to given compensation channel.

Compensation gain is a proportional coefficient and offset is the regulation on deviation.

Light load and heavy load switch compensation are used for elevator industry. When digital quantity is used to compensate torque function, light load switch action is to compensate light load torque, while the heavy load switch action is to compensate heavy load torque.

### 7.9.5 Group P64 Position Control Parameters (spare)

## 7.10 Group P7X Enhanced Control Parameter Groups

### 7.10.1 Group P70 Limit and Protection Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P70.00 | Upper frequency limit (Hz) | 0.01~ max frequency | 50.00 |
| P70.01 | Lower frequency limit (Hz) | 0.01~ Upper frequency limit | 0.00 |
| P70.02 | Maximum output frequency (Hz) | 0.01~300.00 | 55.00 |

Maximum output frequency fmax is the highest frequency permitted to be output by the inverter.

Maximum output voltage Vmax is the output voltage when the inverter is running at the basic running frequency. If a standard AC motor is applied, it is the motor rated voltage, see the motor nameplate.

Upper and lower frequency limit fH and fL are the highest and lowest frequency set for the motor operation as required by production process during application of the user.

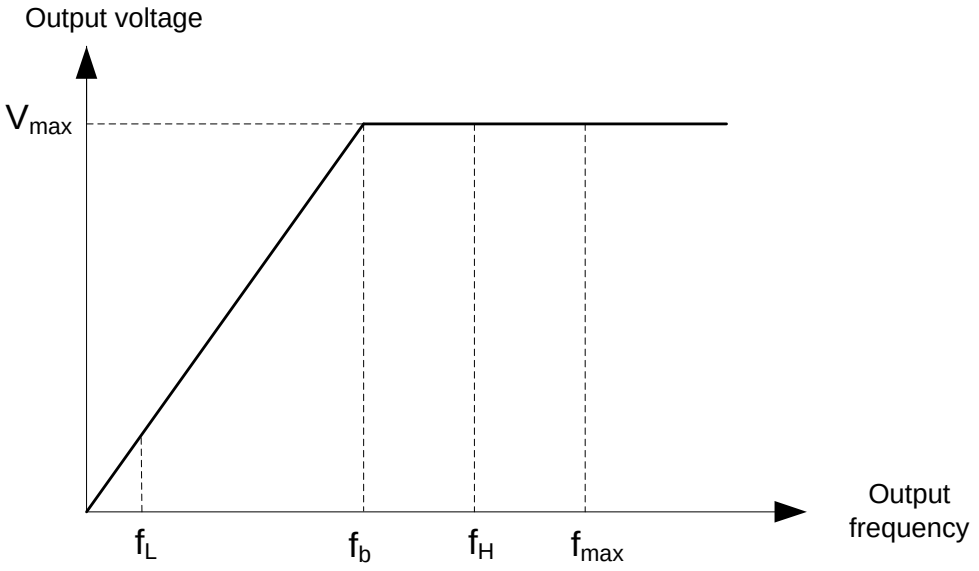



**Figure 7-35 Schematic of the upper and lower frequency limit**

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P70.04 | Output torque limit (%) | 0.00~200.00 | 150.00 |
| P70.05 | Inverter acceleration overcurrent threshold value (%) | 0.00~200.00 | 160.00 |
| P70.06 | Inverter deceleration overvoltage threshold value (V) | 540~800 | 750 |
| P70.07 | Overspeed protection coefficient (%) | 0.00~ | 120.00 |

P70.04 ~ P70.06 set overcurrent and overvoltage threshold for the inverter. In general, when the set speed or the motor load experiences rapid change, output current of the inverter may be greater than the overcurrent protection point, resulting overcurrent fault. Current limit function is that the inverter limits output current with sudden change not greater than the protection action value by means of controlling the transient output, so as to effectively reduce overcurrent fault and guarantee the continuous and reliable operation of the system. When the current exceeds a certain value (P70.04), the inverter enters current limit status; during the constant speed operation, load capacity may be ensured via current limit, free from any overcurrent fault. When the load is reduced, the inverter automatically exits from current limit status and restores to normal operation. The function is especially suitable in the applications with rapid speed or load change.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P70.08 | Special function selection | 0~65535 | 16 |

Set the parameter according to bit, with its specific meaning as: for example 16, indicating the classic speed loop selected for speed loop.

bit3: 8 whether calculate the rotor time constant based on the motor parameters or not (1: based on motor parameters; 0: based on slip frequency);

bit4: 16 Small speed drop for sudden increased load; small speed increase for sudden decreased load.

bit5: 32 undervoltage alarm (1: no alarm; 0: alarm)

bit7: 128 zero servo mode (1: calculate zero servo torque based on acceleration; 0: calculate zero servo torque based on feedback speed)

bit8: 256 encoder phase angle self-learning for every operation (1: Y; 0: once only for electrification)

bit10: 1024 bus voltage compensation for the emergency power operation (1: compensation; 0: no compensation)

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P70.10 | PT signal channel | 0~2 | 0 |
| P70.11 | PT protection upper threshold (V) | 0.000~10.000 | 10.000 |
| P70.12 | PT protection lower threshold(V) | 0.000~10.000 | 0.000 |
| P70.13 | PT protection action delay (s) | 0.0~10.0 | 3.0 |

PT70.10 : PT signal channel selection (0: NC 1: AI0 2: AI1).

Triggering conditions for 49# fault (PT detection fault): after the inverter has run for 5s, “PT > P70.11” or “PT < P70.12” will continue the time set in P70.13;

Clearing conditions for 49# fault (PT detection fault): the inverter stops or clear the fault after "P70.12<PT P70.11" continues for 2s.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P70.14 | HT signal channel | 0~2 | 0 |
| P70.15 | HT protection upper threshold (V) | 0.000~10.000 | 10.000 |
| P70.16 | HT protection lower threshold(V) | 0.000~10.000 | 0.000 |
| P70.17 | HT protection action delay (s) | 0.0~10.0 | 3.0 |

HT signal channel selection (0: NC 1: AI0 2: AI1).

Trigging conditions for 50# fault (Humidity fault): "HT > P70.15" or "PT < P70.16" continues the time set in P70.17.

Clearing conditions for 50# fault (Humidity fault): "P70.16<PT <P70.15"; clear the fault after it is continues for 2s.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P70.18 | Bus undervoltage threshold (V) | 0~540 | 380 |

400V bus undervoltage threshold default is 380V.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P70.19 | Maximum no-load up intercept (%) | 0~400 | 0 |
| P70.20 | Maximum no-load down intercept (%) | 0~400 | 0 |

P70.19 and P70.20 are used to record the system inertia during no-load operation. If speed automatic limit function is applied, final speed limit will be based on this parameter, which is used by the lifting equipment with field weakening control. After system acceleration and deceleration time of the system is changed, set the software version parameter 95.01 = 12.34. The system rises or drops once, set the software version P95.01 = 12.34 again after it stops, then run once again in the opposite direction, P70.19 and P70.20 record no-load torque of system rise or drop after the system stops running. During normal operation, automatic limit function will judge the load weight, so as to decide the final running speed.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P70.21 | PWM detection delay (s) | 0~65535 | 800 |

After the inverter starts to run, if output current is 0 and after parameter PWM detection delay, the inverter sends 51# fault.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P70.22 | Selection below the tower frequency limit | 0~3 | 0 |

Set the running mode when target frequency is below the lower frequency limit:

0: run at the lower frequency limit;

1: stop;

2: run at zero speed;

3: inertia stop;

## 7.10.2 Group P71 Control Optimization Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.00 | Frequency hopping speed 1(Hz) | 0.00~100.00 | 0.00 |
| P71.01 | Frequency hopping speed 2(Hz) | 0.00~100.00 | 0.00 |
| P71.02 | Frequency hopping speed 3(Hz) | 0.00~100.00 | 0.00 |
| P71.03 | Frequency hopping speed (Hz) | 0.00~100.00 | 0.00 |

In order to avoid the mechanical resonance point, set the frequency hopping range for the inverter. The inverter set frequency will be automatically adjusted to frequency hopping section to run when it drops into the frequency hopping. Frequency hopping section ranges from frequency hopping speed - 0.5 * frequency hopping width to frequency modulation speed + 0.5 * frequency hopping width, with 3 frequency modulation sections set totally.

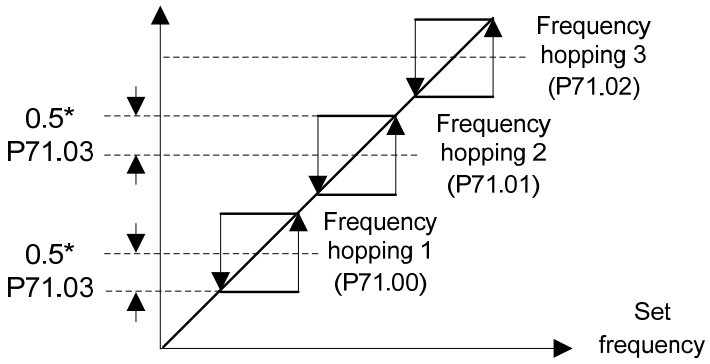



**Figure 7-36 Upper and lower frequency hopping limit**

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.04 | Inertia compensation factor (%) | 0.00~100.00 | 0.00 |
| P71.05 | No reverse | 0~1 | 0 |
| P71.06 | FWD and REV interval time (s) | 0.0~6553.5 | 0.0 |
| P71.07 | PWM modulation mode(s) | 0~2 | 2 |

Rotational inertia compensation factor is determined by P71.04. When the system is in torque control mode and has big system load inertia, it needs to provide the additional rotational inertia compensation during its acceleration and deceleration. For some production equipment, reverse rotation may cause equipment damage. Therefore this function may be adopted to prohibit reverse rotation.

P71.05 factory default: reverse permitted, P71.05=1: no reverse.

When rotation direction of the motor is opposite to that required by the equipment, wiring of any two terminals on output side of the inverter can be exchanged, making the forward direction of the equipment to be consistent with that defined by the inverter.

P71.06 sets the waiting time of the inverter from forward to reverse (or from reverse to forward) when the speed exceeds 0.

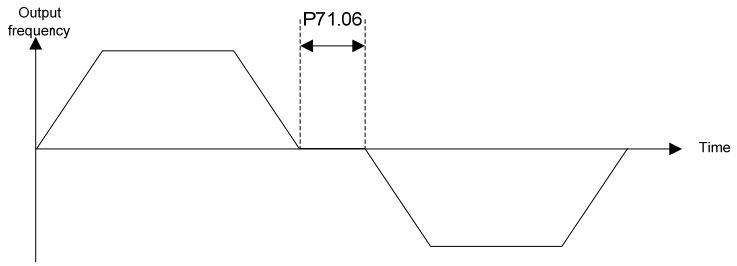



**Figure 7-37 Dead time from forward to reverse**

P71.07 selects PWM modulation mode. 0: 5-secton type; 1: 7-section type; 2: <30%rpm 7-section, >30% rpm 5-section.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.08 | V/F optimization function selection (%) | 0~127 | 32 |

0: Nil

1: torque automatic lifting to improve the low speed loading performance;

2: oscillation suppression to control the motor oscillation during no load and light load;

4: slip compensation to improve speed control precision;

8: stator resistance compensation to improve the low speed loading performance;

16: dead zone compensation to improve voltage precision;

32: bus voltage compensation to stabilize the output voltage;

(bit selection function)

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.09 | V/F torque compensation (%) | 0.0~30.0 | 0.0 |
| P71.10 | V/F compensation maximum frequency (Hz) | 0.0~50.0 | 10.0 |

P71.09 provides the manual compensation torque during V/F control, to effectively improve low speed torque

P71.10 provides the maximum frequency for compensation torque during V/F control

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.11 | Dead zone compensation mode | 0~2 | 0 |

Dead zone compensation mode

0: compensate 100% as per angle;

1: compensate 50% as per angle;

2: make compensation as per current;

Generally no adjustment.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.12 | Current slow down time (s) | 0.01~655.35 | 0.00 |
| P71.14 | Carrier frequency kHz) | 1.1~8.0 | 2.0 |
| P71.15 | Random PWM width (kHz) | 0.000~1.000 | 0.000 |

Setting of current slow down time may reduce the crash noise produced when the motor stops, which only applies to closed loop.

Carrier frequency regulation: when the inverter motor is too noisy, increase carrier frequency to lighten it. Random PWM width can regulate the carrier frequency section, for example: when carrier

frequency is 6 and random width is 1KHz, carrier frequency randomly changes within 5.5-6.5, which also is used to reduce the motor noise.

Note: default carrier frequency of AS series is related to the inverter power, the bigger the power, the lower the default carrier frequency. If the default value is exceeded, please derate it, derating 10% for each increase of 1K.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.16 | Regulator mode | 0~3 | 1 |

Regulation period of speed loop when set the vector control, 0: 0.5ms，1: 1ms，2: 4ms 3: 4ms，the bigger the value, the slower the speed regulation, to reduce the electromagnetic noise of the motor.

Regulator mode is different according to the different default carrier frequency of the inverter. When the default carrier frequency ≥4kHz, default regulation mode is 1; when the default carrier frequency ≤3kHz, default regulation mode is 2.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.17 | Contactor on delay (s) | 0.0~10.0 | 0.8 |
| P71.18 | Opening delay (s) | 0.0~10.0 | 0.4 |
| P71.19 | Contactor off delay (s) | 0.0~10.0 | 1.0 |
| P71.20 | Braking delay (s) | 0.0~10.0 | 0.1 |
| P71.21 | Output off delay (s) | 0.0~10.0 | 0.3 |

These parameters mainly are used for control system, to increase control logic of output contactor and external brake. Adjustment of delay time will realize more stable control and improve the comfort.

Also these parameters can be applied in the applications provided with lifting mechanism and requiring output contactor control.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.22 | Zero speed threshold (Hz) | 0.0~10.0 | 0.2 |

P71.22 sets zero speed threshold, default 0.2Hz. If the actual running frequency is below the set value, then it is zero speed.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.23 | Forward dead zone compensation (%) | 0~100 | 100 |
| P71.24 | Reverse dead zone compensation (%) | 0~100 | 100 |

P71.23 makes compensation for open and close switching dead zone time of the forward upper and lower bridge arm, default 100%.

P71.24 makes compensation for open and close switching dead zone time of the reverse upper and lower bridge arm, default 100%.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.25 | Zero servo compensation (%) | 0~100 | 0 |

P71.25 zero servo compensation

Under the closed loop vector control mode and when the incremental encoder is used, if P71.25>0, P71.25 compensation will be overlaid on the output of zero servo regulating loop, lasted

for P11.07 zero servo compensation time.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.28 | Zero servo current loop gain factor (%) | 50~200 | 100 |

P71.28: Torque current PI parameter used to change zero servo using zero servo gain won't be altered generally, when shake or overcurrent appears during zero servo, properly regulate P71.28.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.29 | PWM modulation selection | 0~1 | 0 |

PWM modulation mode

0: underflow update

1: overflow/underflow update, carrier frequency below 4k, please set as 1.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.33 | Speed precision adjustment (%) | 0.0~100.0 | 100.0 |
| P71.34 | Performance improvement compensation | 0~1000 | 106 |
| P71.35 | System inertia coefficient (%) | 0.0~300.0 | 100.0 |
| P71.36 | Automatic torque lifting at low speed (%) | 0.0~300.0 | 100.0 |

The above parameters are to set the characteristics of vector control 1 without speed sensor. If the acceleration and deceleration time are short, increase P71.35 to quicken speed response. If it is difficult to start, with more low speed torque requirements, please increase P71.36.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.37 | Droop control gain (%) | 0.0~200.0 | 0.0 |
| P71.38 | Droop control filtering (S) | 0.00~2.00 | 0.05 |

When 2 motors are used to drive a load, the parameters play a role in keeping its entire balance. For the inverter controlling two motors, DROOP control function of one motor must be valid. DROOP control is to decelerate and accelerate the motor when torque command is too high and too low respectively, so as to keep balance. By use of DROOP control function, the ordinary motor shares the torque characteristics as those of high resistance motor.

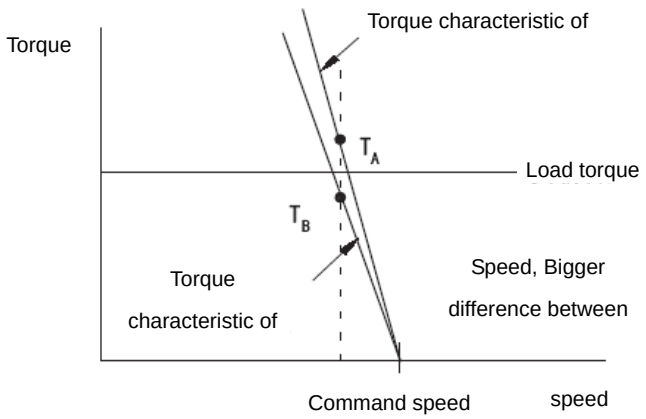



**Figure 7-38 Load balance of two motors using Droop function**

P71.37 adjustment principle: when torque command is 100%, set the deceleration value taking % as unit (maximum output frequency =100%). When it is set as 0.0, DROOP control will be

invalid. P71.38: adjust responsiveness of DROOP control. Please reduce the set value if the response is slow, please increase it if vibration or imbalance appears.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.39 | Power failure detection threshold (V) | 380~550 | 480 |
| P71.40 | KEB bus target voltage (V) | 380~550 | 500 |

It is set as 480 typically. If fault is sent during KEB, refer to the inverter bus voltage and properly increase it.

This value shall be greater than P71.39 (power failure detecton threshlold) and below the inverter bus voltage during normal power supply. Refer to the inverter bus voltage and properly increase it.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.41 | Power failure treatment mode | 0~4 | 0 |

0: no treatment;

1: track start (time limit)

2: track start (time unlimited)

3:KEB (with detection undervoltage): start to use KEB, if it exceeds P71.42 (longest power failure compenstaion time), the bus voltage is still low, then undervoltage fault will be sent.

4:KEB ( no detection undervoltage)

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.42 | Longest power failure compenstaion time (s) | 0.0~60.0 | 3.0 |

If it exceeds P71.42 (longest power failure compenstaion time) after KEB is used, the bus voltage is still low, then undervoltage fault will be sent.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.43 | KEB shortest actuation time (ms) | 0~2000 | 100 |

After KEB is used, P71.43 (KEB shortest actuation time) is required to exit KEB.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.44 | KEB starting frequency reduction (Hz) | 0.00~5.00 | 2.00 |

To make the motor to be in generating status quickly, set this value within 0-2 times of the motor rated slip frequency range

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.45 | KEB deceleration time (s) | 0..00~200.00 | 10.0 |

If KEB takes action, increase this value if overvoltage appears, while decrease it if undervoltage or overcurrent appears.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.46 | KEB deceleration mode | 0~3 | 0 |

It does't need to set this parameter.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.47 | KEB acceleration time (s) | 0.00~300.00 | 25.00 |

Keep the same as the motor acceleration time set.

Set the following parameters according to the listed value, no alteration.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.48 | Proportional Kp of KEB | 0.00~300.00 | 200.00 |
| P71.49 | Integral Ki of KEB | 0.00~300.00 | 0.00 |
| P71.50 | Differential Kd of KEB | 0.00~300.00 | 0.00 |
| P71.51 | KEB upper integral limit (%) | 0.0~300.0 | 100.0 |
| P71.52 | KEB lower integral limit (%) | 0.0~300.0 | 100.0 |
| P71.53 | KEB closed loop upper output limit (%) | 0.0~300.0 | 100.0 |
| P71.54 | KEB closed loop lower output limit (%) | 0.0~300.0 | 100.0 |

Set as default value without change.

For Kp during KEB, KEB time will be too short if this value is too small, while bus overvoltage fault may be caused if it is too big.

For Ki during KEB, KEB time will be too short if this value is too small, while bus overvoltage fault may be caused if it is too big.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.55 | KEB upper voltage deviation limit (V) | 0.0~500.0 | 300..0 |

When KEB is enabled, deviation between bus voltage and set target voltage is limited not exceeding P71.55 (KEB upper voltage deviation limit). If it is greater than this value, then it equals to this value.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.56 | KEB voltage zero deviation value (V) | 0.0~10.0 | 0.0 |

Bus voltage deviation is 0 if it is less than this value.

| Function code | Function Name | Range | Default value |
|---|---|---|---|
| P71.57 | Variable carrier frequency threshold | 0.0~50.0 | 0.0 |

P71.57 variable carrier frequency threshold, output frequency is below this value. If P71.29=0, carrier frequency drops to 3K; if P71.29=1, carrier frequency drops to 2K to run. If it is set as 0, indicating the normal carrier operation.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.58 | Fan control selection | 0~4 | 0 |

0: The fan operates when the inverter starts to run; when the inverter stops, the fan will stop 1 min later.

1: The fan operates when the inverter starts to run; when the inverter stops, the fan will stop 5 minutes later.

2: The fan operates when the inverter starts to run; when the inverter stops, the fan will stop 30 minutes later.

3: Fan operation conditions. The fan will operate only if the radiator is greater than 40℃; when it is below 35℃, the fan will stop after 1s delay.

4: Operate all the time after power on

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.59 | Optimal coefficient 1 | | 0.0000 |
| P71.60 | Optimal coefficient 2 | 1.0~300.0 | 100.0 |
| P71.61 | Optimal coefficient 3 | 1.0~300.0 | 100.0 |

The above parameters are valid under open loop vector, P71.59 is the inverter internal paramter, no midification is needed.

P71.60 and P71.61 are control gain when switching the forward and reverse.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P71.62 | UP/DOWN single step length | 0.00~10.00 | 0.10 |

By use of UP/DOWN function, set the variation of each step with this parameter.

## 7.11 Group P8X Communication Parameter Groups

### 7.11.1 Group P80 Communication Selection Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P80.00 | Communication mode selection | 0~3 | 0 |

Select the communication mode applied by the existing inverter, default 0

0: no communication

1: Profibus-DP

2: Modbus

3: Canbus

### 7.11.2 Group P81 Modbus Communication Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P81.01 | Communication baud rate | 0~7 | 3 |
| P81.02 | Data format | 0~2 | 0 |
| P81.03 | Transmission mode selection | 0~1 | 1 |

The inverter supports the internationally aceepted Modbus protocol, RTU format. See the appendix.

P81.00 determines communicaiton baud rate and supports 1200~57600bps.

0: 1200bps

1: 2400bps

2: 4800bps

3: 9600bps

4: 19200bps

5: 38400bps

6: 57600bps

7: 76800bps

P81.01 sets communication format, odd-even check.

0: format 1-8-1, no check.

1: format 1-8-1, even check.

2: format 1-8-1, odd check.

P81.02 sets transmission mode: 0: ASCII; 1: RTU

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P81.04 | Local address | 1~247 | 1 |

P81.04 sets the local address, 0=broadcast address, the available address 1 ~ 247, the reserved address 248 ~ 255.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P81.05 | Communication status word set 1 | | |
| P81.06 | Communication status word set 2 | | |

Monitor the communication status word value. See the communication appendix below for composition of the specific status word.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P81.07 | Communication address format selection | 0~1 | 1 |

Select communication address format, 0: hexadecimal number system; 1: decimal number system.

### 7.11.3 Group P82 Profibus_DP Communication Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P82.00 | Local address | 0~255 | 0 |
| P82.01 | Big and little endian mode | 0~1 | 0 |

P82.00 indicates the local address

P82.01 sets the big and little endian mode

0: the higher 8 bits will be sent firstly, then the lower 8 bits

1: the lower 8 bits will be sent firstly, then the higher 8 bits

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P82.02 | Self-defined status word 1 | 0~59 | 16 |
| P82.03 | Self-defined status word 2 | 0~59 | 13 |
| P82.04 | Self-defined status word 3 | 0~59 | 10 |
| P82.05 | Self-defined status word 4 | 0~59 | 18 |

P82.02 ~ P82.05 set self-defined status:

0: running status 1

1: running status 2

2: detection status

3 ~ 9: spare

10: output torque

11 ~ 12: spare

13: target frequency given

14: current running frequency

15: feedback speed Hz
16: feedback speed rpm
17: spare
18: output voltage effective value
19: output current effective value
20 ~ 21: spare
22: output total power
23: bus voltage
24 ~ 28: spare
29: output terminal status
30: spare
31: input terminal status
32 ~ 33: spare
34: analog input AI0
35: analog input AI1
36: spare
37: output DA0
38: output DA1
39: spare
40: recent fault No.
41 ~ 42: spare
43: radiator temperature
44 ~ 59: spare
Note: Profibus_DP communication inverter GSD document download address:

Open http://www.stepelectric.com and click “support and download” .

## 7.12 Group P9X Fault and Display Parameter Groups

### 7.12.1 Group P90 Language Selection Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P90.00 | Manipulator language selection | 0~1 | 0 |

P90.00 language selection: 0: Chinese; 1: English;

### 7.12.2 Group P91 LCD Display Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P91.00 | U01 display data | 0~34 | 20 |
| P91.01 | U02 display data | 0~34 | 2 |
| P91.02 | U03 display data | 0~34 | 3 |
| P91.03 | U04 display data | 0~34 | 4 |
| P91.04 | U05 display data | 0~34 | 6 |
| P91.05 | U06 display data | 0~34 | 16 |

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P91.06 | U07 display data | 0~34 | 7 |
| P91.07 | U08 display data | 0~34 | 5 |

Display parameters of 8 LCDs are set totally, shown as the following table:

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| 0 | 0 no-definition | 1 | Output speed rpm |
| 2 | Given speed Hz | 3 | Feedback speed Hz |
| 4 | Output current A | 5 | Output voltage V |
| 6 | Output torque % | 7 | Bus voltage V |
| 8 | Spare | 9 | Spare |
| 10 | Spare | 11 | Count value of phase AB during Z signal |
| 12 | Count value of phase AB | 13 | Angle of phase U |
| 14 | Pulses corresponding to CD | 15 | Encoder position angle |
| 16 | Pre-torque % | 17 | Number of interference of phase Z |
| 18 | Number of interference of phase AB | 19 | Running status |
| 20 | Target speed (Hz) | 21 | Encoder sin central point |
| 22 | Encoder cos central point | 23 | Weighing compensation |
| 24 | Given speed (rpm) | 25 | Speed variation (rpm) |
| 26 | Weighing compensation % | 27 | Encoder phase C central point |
| 28 | Encoder phase D central point | 29 | Radiator temperature |
| 30 | Input port status | 31 | Output port status |
| 32 | PID given value | 33 | PID feedback value |
| 34 | Output power | | |

### 7.12.3 Group P92 LED Display Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P92.00 | LED display data | 0~34 | 2 |

See group P90 for its meaning.

### 7.12.4 Group P93 Running Record Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P93.00 | Accumulative local power on time (kh) | 0.000~65.535 | 0.000 |
| P93.01 | Accumulative local running time (kh) | 0.000~65.535 | 0.000 |
| P93.02 | Maximum radiator temperature record (℃) | 0.0~100.0 | 0.0 |

The inverter will record the following information automatically: accumulative local power on time, accumulative local running time and maximum radiator temperature record.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P93.03 | Accumulative output power of the inverter (kWh) | 0.0~999.9 | 0.0 |

The inverter starts to run after power on, accumulative output power in unit time, with the unit kWh.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P93.04 | Accumulative output power of the inverter (MWh) | 0~65535 | 0 |

The inverter starts to run after power on, accumulative output power in unit time, with the unit MWh.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P93.05 | Running time of the inverter fan (h) | 0~65535 | 0 |

Running time of the inverter fan, unit h.

### 7.12.5 Group P94 Troubleshooting Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P94.00 | Inverter minor fault handling mode | 0~3 | 1 |
| P94.01 | Inverter fault automatic reset time (s) | 0.0~180.0 | 10.0 |
| P94.02 | Inverter fault automatic reset number | 0~100 | 0 |

P94.00 sets fault handling mode,

0: when minor fault appears, no fault relay output;

1: when minor fault appears, fault relay output;

2: when 52#PTC fault appears, fault relay output and the inverter stops, no fault automatic reset,

3: 1 and 2 are both valid.

P94.01 sets automatic reset time, default 10s

P94.02 sets number of automatic reset during 30 min, default 0. The default value is not automatic reset, automatic reset fault may cause dangerous operation, please use carefully.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P94.03 | Radiator overheating time (s) | 0.0~180.0 | 0.5 |
| P94.04 | Overspeed protection time (s) | 0.00~180.00 | 1.00 |
| P94.05 | Input phase loss voltage threshold | 0~150 | 65 |
| P94.06 | Number of short circuit of braking resistor | 0~100 | 10 |

P94.03 sets the protection time for radiator overheating protection (3# fault). When the radiator temperature exceeds 80℃, continue P94.03 time protection ;

P94.04 sets the confirm time for overspeed protection (30# fault);

P94.05 sets the judge voltage sag value for input phase loss (29# fault). When input voltage fluctuation is greater than P94.05, it can be increased in the areas with unstable grid.

P94.06 sets fault confirm number of braking resistor fault (4# fault).

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P94.07 | SinCos encoder disconnection confirm number | 0~100 | 2 |

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P94.08 | Input phase loss confirm time (s) | 0.000~180.000 | 2.000 |
| P94.09 | Relay fault confirm voltage (V) | 0~350 | 90 |
| P94.10 | Misphase judgement threshold for phase CD | 300~1000 | 300 |
| P94.11 | ABZ protection threshold(%) | 20~100 | 20 |

P94.07 is SinCos encoder disconnection confirm number:

AB signal continues 94.07 protection at high or low order simultaneously;

CD signal continues 94.07+5 times protection at high or low order simultaneously.

P94.08 input phase loss confirm time set is detected only during normal running or encoder dynamic self-learning. Time protection when phase current continuously exceeds P94.08.

P94.09 is relay fault confirm voltage, which is VDC1 when the inverter doesn't run, and VDCmax and VDCmin when the inverter runs, detected once every 20ms (VDC1-VDCmax). It is greater than 94.09 and (VDC1-VDCmax)>(VDCmax-VDCmin)*5, continued for 10 times, protected.

P94.10 sets misphase judgement threshold for phase CD

(1) For SinCos encoder, difference value of AB signal and CD signal exceeds 94.10 and lasts for 500ms protection;

(2) Difference value between Endate absolute position and position of AB signal exceeds 94.10 protection.

P94.11 is ABZ protection threshold for the incremental encoder.

P10.00=3, feedback speed < 1%, for big speed error, lasted for 400ms, protected.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P94.12 | IGBT protection number | 0~65535 | 2 |

Set the number of times that the inverter output current is greater than IGBT protection current threshold (21# fault).

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P94.13 | $I^2t$ protection selection | 0~3 | 0 |

Protection selection parameter P94.13 defaults to 0, then I2t protection plays a role. If it is set as 1, only 45# or 46# protection fault, applying to frequent start or stop. If it is set as 2, only 21# or 27# protection fault, applying to continuous overload applications. If it is set to 3, no protection for $I^2t$.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P94.14 | Analog A0 disconnection value (%) | 0.0~100.0 | 0.0 |
| P94.15 | Analog A1 disconnection value (%) | 0.0~100.0 | 0.0 |

Analog A0/A1 input signal disconnection detection value, relative to 10V percentage. If analog A0 input voltage < 10V * P94.14/P94.15, analog input disconnects.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P94.16 | Abnormal analog treatment | 0~5 | 0 |

If the inverter sends an abnormal analog input fault, set the inverter how to run. P94.16 set value:

0: no action of the inverter;

1: protection shutdown

2: run at the frequency for abnormal analog;

3: run at the frequency set in P70.00;

4: run at the frequency set in P70.01;

5: run at the frequency set in multi-speed 15.

P94.16=1, no automatic reset for the fault, automatic reset for others.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P94.17 | Temperature sampling disconnection treatment | 0~1 | 0 |

If the inverter sends temperature sampling disconnection fault, how does the inverter run. P94.17=0, indicating no action for the inverter; 1: protection shutdown.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P94.18 | Communication protection | 0~1 | 1 |
| P94.19 | Communication disconnection protection time (s) | 0.000~65.535 | 2.000 |

P94.18 0: not used 1: start communication protection

After the normal communication interruption lasts for P94.19, send 43# fault.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P94.20 | Number of grounding protection (times) | 0~65535 | 100 |

Set confirm times of 32# fault.

### 7.12.6 Group P95 Product Identification Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P95.00 | Inverter hardware version | | 500.04 |
| P95.01 | Control board software version | | factory |

Default not to use functions of the oscilloscope of the upper computer. Set P95.01 as 3728 to start the oscilloscope. Set P95.01 as 3728 again not to start the oscilloscope; it needs to reset after power failure and power on once again.

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P95.02 | Version number | | 100.01 |
| P95.03 | Profibus_DP software version | | factory |

Software and hardware version parameters of the inverter are displayed in group P95, which are set directly by the manufacturer.

## 7.12.7 Group P96 Inverter Product Parameters

| Function code | Function name | Setting range | Factory default |
|---|---|---|---|
| P96.00 | Inverter rated power (kW) | 0.0~999.9 | |
| P96.01 | Inverter rated current (A) | 0.0~999.9 | |
| P96.02 | Inverter maximum current (A) | 0.0~999.9 | |
| P96.03 | Inverter rated voltage (V) | 0~460 | 380 |
| P96.04 | Inverter power factor (%) | 0~99 | 15 |
| P96.05 | Inverter sensor current (A) | 0~9999 | 404 |
| P96.06 | Inverter module rated current (A) | 0~9999 | |
| P96.07 | Built-in braking unit current (A) | 0~9999 | |
| P96.08 | 3-phase current balance coefficient(%) | 0.800~1.200 | 1.000 |
| P96.09 | ID_0 | 0~65535 | 13567 |
| P96.10 | ID_1 | 0~65535 | 36773 |
| P96.11 | ID_2 | 0~65535 | 13142 |
| P96.12 | ID_3 | 0~65535 | 14387 |
| P96.13 | ID_4 | 0~65535 | 6276 |
| P96.14 | ID_5 | 0~65535 | 8259 |
| P96.15 | ID_6 | 0~65535 | 19 |
| P96.16 | Special parameter | 0~65535 | 90 |

Fixed parameters of the inverter are displayed in group P96, which are set directly by the manufacturer:

P96.00 ~ P96.04, initially set by the manufacturer;

P96.05 ~ P96.16, parameter setting of the inverter itself, determined by hardware, read-only.

# Chapter 8 Fault Check

This chapter describes inverter faults, fault codes, contents, reasons and their solutions in details, and provides analysis flow chart for all kinds of faults during motor adjusting or operating.

**Danger**

◎ **Maintenance operation should start 10 minutes after power supply is cut off. At that time, charging indicator must be off completely or voltage of DC bus is lower than 24 VDC.**

Or it may cause electric shock.

◎ **To retrofit inverter privately is absolutely prohibited.**

Or it may cause electric shock or human injury.

◎ **Only professional electrician can perform maintenance operation. Leaving cable stub or metal obstacle inside inverter is prohibited.**

Or it may cause fire hazard

**Notice**

◎ **Don't change wiring and connect/disconnect terminal blocks during power on.**

Or it may cause electric shock.



## 8.1 The Function of Protection and Check

When inverter fault occurs, fault LED on top of digital operator blinks. LED displays the current fault code.

Inverter has total 39 fault codes. Fault list table 8.1 shows the fault codes and their reasons, solutions.

**Table 8.1 Fault list**

| Fault code | Fault display | Possible reason | Solution |
|---|---|---|---|
| 1 | Module over-current protection | Too high voltage at DC terminal | Check network power for fast stop under high inertia load, no dynamic braking |
| | | Possible short connection to peripheral circuit | Check any short circuit between motor and output connection, grounding |
| | | Losing output phase | Check any loose connection for motor and output |
| | | Encoder fault | Check encoder or its wiring |
| | | Hardware poor contact or damage | Need maintenance by professional technician |
| | | Internal component loose | Need maintenance by professional technician |
| | | The power circuit components overheat due to the cooling fan or cooling system problem. | Check the cooling fan. Check whether the cooling fan power is blocked by dirt or foreign object. |
| | | Warning: The inverter must started only after eliminating the malfunction causes, avoiding the damage to IGBTs | |
| 2 | ADC fault | Current sensor damaged | Replace current sensor |
| | | Problem of current sampling loop | Replace control board |
| 3 | Heatsink overheat | Ambient temperature too high | Reduce ambient temperature, increase ventilation. Keep the surrounding temperature below 40 ℃ or according to this character to test the capacity of the inverter. |
| | | The cooling fan damaged or foreign object entered into the cooling system. | Check whether the fan power cable is well connected, or replace the same model fan or remove the foreign objects. |
| | | Cooling fan is abnormal | Check the cooling fan. Check whether the cooling fan power is correct and whether there is any foreign object blocking the fan. |
| | | Temperature detect circuit fault | Need maintenance by professional technician |
| 4 | Braking unit failure | Braking unit damaged | Replace related driving module or control circuit board |
| | | External braking resistor circuit short | Replace the resistance or the wiring connection |
| 5 | Blown fuse failure | Fuse blown by high current | Check the fuse circuit connection, or looseness of connectors |
| 6 | Over torque output | Too low input voltage | Check input power supply |
| | | Motor stop rotating or abrupt | Prevent motor stopping, reduce abrupt loading change |

| Fault code | Fault display | Possible reason | Solution |
|---|---|---|---|
| | | loading change | |
| | | Encoder failure | Check encoder or its wiring |
| | | Missing output phase | Check the loose connection of motor and output wiring |
| 7 | Speed deviation | Too short acceleration time | Extend acceleration time |
| | | Too high load | Reduce load |
| | | Too low current limit | Increase current limit under allowed range |
| 8 | Bus over voltage protection (in acceleration running) | Abnormal input voltage | Check input power supply |
| | | Re-rapid starting during motor in high speed rotating | Wait till motor stop rotating, and re-start |
| | Bus over voltage protection (in deceleration running | Too high load rotational inertia | Select proper energy consumed braking component |
| | | Too short deceleration time | Extend deceleration time |
| | | Too high braking resistance or no resistor | Connect proper braking resistor |
| | Bus over voltage protection (running at constant speed) | Abnormal input power | Check input power supply |
| | | Too large load rotational inertia | Select proper energy consumed braking component |
| | | Too high braking resistance or no resistor | Connect proper braking resistor |
| 9 | Bus undervoltage | Power voltage lower than minimum equipment working voltage | Check input power supply |
| | | Instantaneous power off | Check input power supply, reset and restart after input power back to normal |
| | | Too high fluctuation of input power voltage | |
| | | Loose power connection block | Check input wiring |
| | | Internal switch power abnormal | Need maintenance by professional technician |
| | | A large starting current load existing in the same power supply system | Alter power system to conform the specification |
| 10 | Loss of output phase | Abnormal wiring at inverter output, missing or breaking connection | Check wiring at inverter output side based on operation procedure, eliminate missing, breaking connection |

| Fault code | Fault display | Possible reason | Solution |
|---|---|---|---|
| | | Loose output terminal block | |
| | | Insufficient motor power, less than 1/20 of maximum applicable inverter motor capacity | Adjust the capacity of inverter or motor |
| | | Unbalanced three phase output | Check the motor wiring |
| | | | Check the consistency of characteristic of inverter output side and DC side terminals |
| 11 | Motor over current at low speed (during acceleration) | Low network voltage | Check input power supply |
| | | Improper motor parameter setting | Set proper motor parameters |
| | | Rapid start during motor running | Restart after motor stop running |
| | | The acceleration time for load inertia (GD2) is too short. | Extend the acceleration time |
| | Motor over current at low speed (during deceleration) | Low network voltage | Check input power supply |
| | | Too large load rotational inertia | Select proper energy consumed braking component |
| | | Improper motor parameter setting | Set proper motor parameters |
| | | Too short deceleration time | Extend deceleration time |
| | | The deceleration time for load inertia (GD2) is too short | Prolong the slowdown time |
| | Motor over current at low speed (during constant speed) | Abrupt load change in running | Reduce frequency and amplitude of abrupt load change |
| | | Improper motor parameter setting | Set proper motor parameters |
| 12 | Encoder failure | Incorrect encoder connection | Correct wiring encoder |
| | | Encoder no signal output | Check encoder and power supply |
| | | Encoder wire disconnected | Re-connect |
| | | Abnormal function code setting | Ensure the proper encoder function code setting |
| 13 | Current detected | Current keep on flowing | Slip happens by motor |

| Fault code | Fault display | Possible reason | Solution |
|---|---|---|---|
| | at stopping | while motor stops | Need maintenance by professional technician |
| 14 | Reversed speed during operation | Reversed speed during operation | Check the abrupt change of external load |
| | | Phase differed between encoder and motor | Change motor or phase order |
| | | Motor reversed by starting, current reaches the limit | Current limitation is too low or motor unmatched |
| 15 | Speed detected at stopping | Elevator slip due to loose brake | Check brake |
| | | Encoder interfered or loose | Tighten encoder, eliminate interference |
| 16 | Wrong motor phase | Motor reversed connected | Correct connection or adjust parameter |
| 17 | Over speed in the same direction (in maximum allowed speed) | Wrong encoder parameter or interference | Check encoder circuit |
| | | Too large positive load or abrupt load change | Check the reason for abrupt load change |
| 18 | Over speed in opposite direction (in maximum allowed speed) | Wrong encoder parameter or interference | Check encoder circuit |
| | | Too large reversed load or abrupt load change | Check the reason for abrupt load change |
| 19 | UVW encoder wrong phase order | Incorrect encoder connection or wrong parameter | Check connection or change parameter |
| 20 | Encoder communication fault | Encoder fault | Check encoder wiring and re-do encoder self-learning |
| 21 | abc over current (3 phase instantaneous value) | Motor single phase shorted to earth | Check motor and output circuit |
| | | Encoder fault | Check encoder and correct wiring |
| | | Test loop of drive board fault | Replace drive board |
| 22 | Brake detection fault | Inactive output relay | Check relay control loop |
| | | Relay triggered, brake not released | Check the brake power string for loosening or breaks |
| | | No signal detected by feedback component | Tune feedback component |
| 23 | Input | Too high input voltage | Check whether input voltage matches inverter rating |

| Fault code | Fault display | Possible reason | Solution |
|---|---|---|---|
| | over-voltage | Problem by detection loop of switch voltage | Need maintenance by professional technician |
| 24 | UVW encoder wire broken | Encoder wiring fault | Wiring block loose or wire broken in connection |
| 25 | Reserved for future use | | |
| 27 | Output over current (valid value) | Too long time operation under overload status. The larger the load, the shorter the time is. | Stop for a while, if problem occurs again after re-operation, check to ensure the load in allowed range. |
| | | Motor blocked | Check motor or brake |
| | | Motor coil short | Check motor |
| | | Output short | Check wiring or motor |
| 28 | SIN/COS encoder fault | Damaged encoder or wrong wiring | Check encoder and its wiring |
| 29 | Loss input phase | Abnormal voltage at input side | Check grid voltage |
| | | Loss input voltage phase | |
| | | Input terminal block loose | Check input terminal wiring |
| 30 | Over speed protection (exceed maximum protected speed limit) | Wrong encoder parameter set or interference | Check encoder circuit |
| | | Abrupt load change | Check the external reason for abrupt load change |
| | | Wrong parameter for over speed protection | Check parameter |
| 31 | Over current at motor high speed | Power grid voltage too low | Check input power supply |
| | | Abrupt load in operation | Reduce frequency and amplitude of abrupt load change |
| | | Incorrect motor parameter | Set motor parameter correctly |
| | | Wrong encoder parameter or interference | Check encoder circuit |
| 32 | Grounding protection | Wrong wiring | Refer to user manual, correct the wrong wiring |
| | | Abnormal motor | Replace motor, to have a grounding isolation test first |

| Fault code | Fault display | Possible reason | Solution |
|---|---|---|---|
| | | Large drain current to earth at inverter output side | Need maintenance by professional technician |
| 33 | Capacitor aged | Inverter capacitor aged | Need maintenance by professional technician |
| 34 | External fault | External fault signal input | Check the reason for external fault |
| 35 | Unbalance output | Abnormal wiring at inverter output side, missing or broking connection | Check inverter output side wiring follow the operation procedure, eliminate possible missing, broking connection |
| | | Motor three phase unbalance | Check motor |
| 36 | Wrong parameter setting | Wrong parameter setting | Modify inverter parameter |
| 37 | Current sensor fault | Drive board hardware fault | Need maintenance by professional technician |
| 38 | Brake resistor short | Connection of external brake resistor short | Check the wiring of brake resistor |
| 39 | Too high instantaneous current | Three phase instantaneous current over and alarm while Ia, Ib and Ic not in operation | Need maintenance by professional technician |
| 40 | KMY detection fault | KMY detect contactor signal and KMY control signal don't match | Check the contactor of KMY control and KMY detection |
| 41 | Brake switch detection fault | Brake switch detect contactor signal and its control signal don't match | Check brake switch |
| 42 | IGBT short circuit protection | She cause is the same as Fualt 1. | Check short circuit for motor and output wiring, grounding |
| 43 | Communication fault | Communication disconnected No communication data received within the fixed time | Check the communication signal line |
| 44 | The input power supply is abnormal | 1. The input power supply changes a lot<br>2. Input contactor abnormally connected<br>3. Temporary electricity | 1. Check the power supply<br>2. Check input contactor |
| 45 | I2t instantaneous over current protection | Same as fault 21,27 | Same as fault 21,27 |
| 46 | I2t valid over current | | |

| Fault code | Fault display | Possible reason | Solution |
|---|---|---|---|
| | protection | | |
| 47 | Abnormal analog input | Analog input signal disconnected<br>Abnormal analog input signal | 1. Modify the related parameters<br>2. Check analog input signal |
| 48 | Temperature sampling disconnection | Radiator temperature sampling disconnected | Check connection of temperature sampling |
| 49 | PT detection fault | PT input signal disconnected<br>Abnormal PT input signal | Check PT input signal<br>Modify the related parameters |
| 50 | Humidity fault | HT input signal disconnected<br>Abnormal HT input signal | 1. Check HT input signal<br>2. Modify the related parameters |
| 51 | Abnormal running output current | Improper parameter setting<br>Disconnection between the inverter and the motor<br>Inverter hardware fault | Check P70.21<br>Check the connecting line<br>Ask the professionals to have maintenance |
| 52 | Motor PTC overheat warning | Motor continuous overload<br>Small motor model<br>Abnormal PTC | Check the load<br>Calculate the motor model<br>Check PTC |

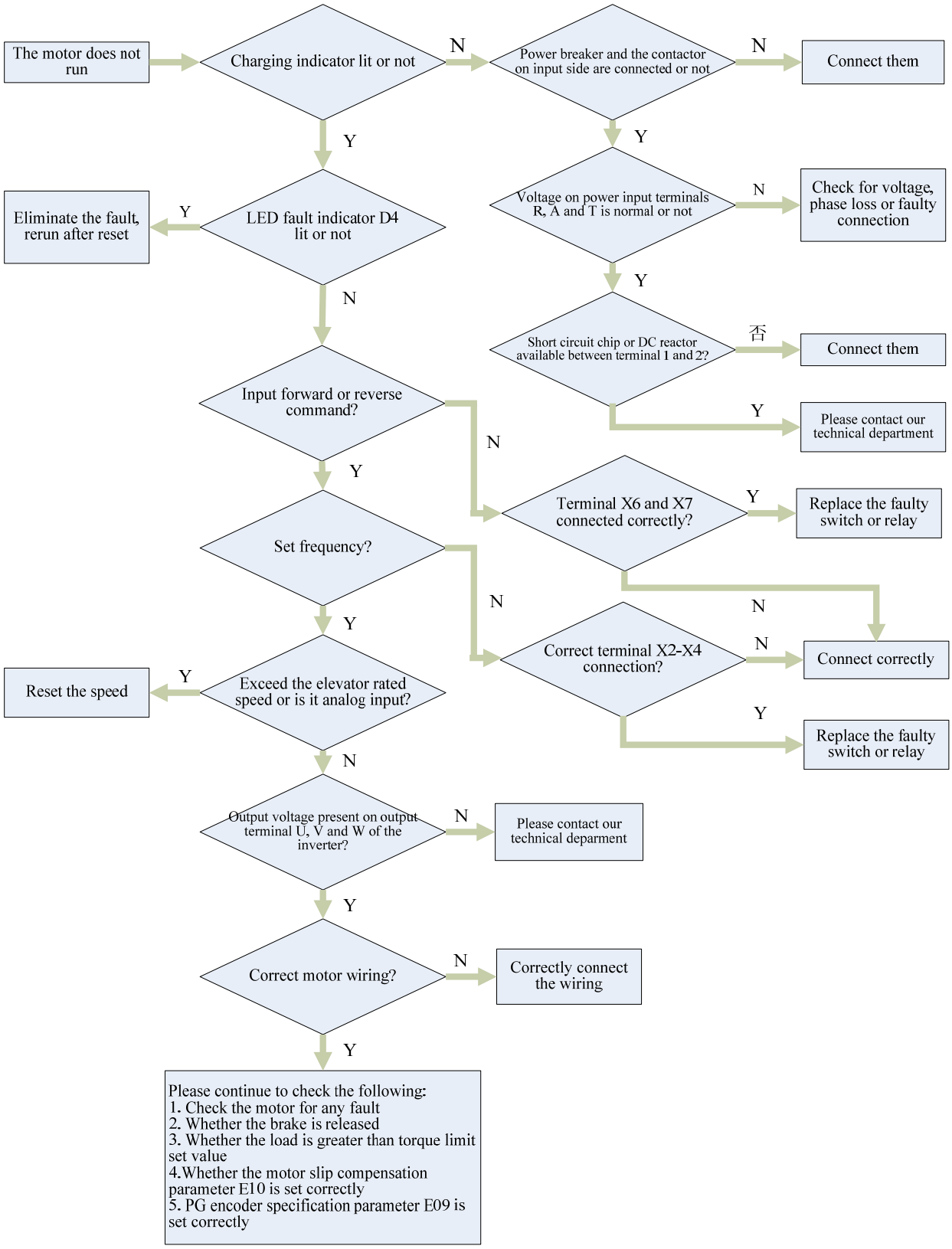


## 8.2 Fault Diagnosis Flow Chart

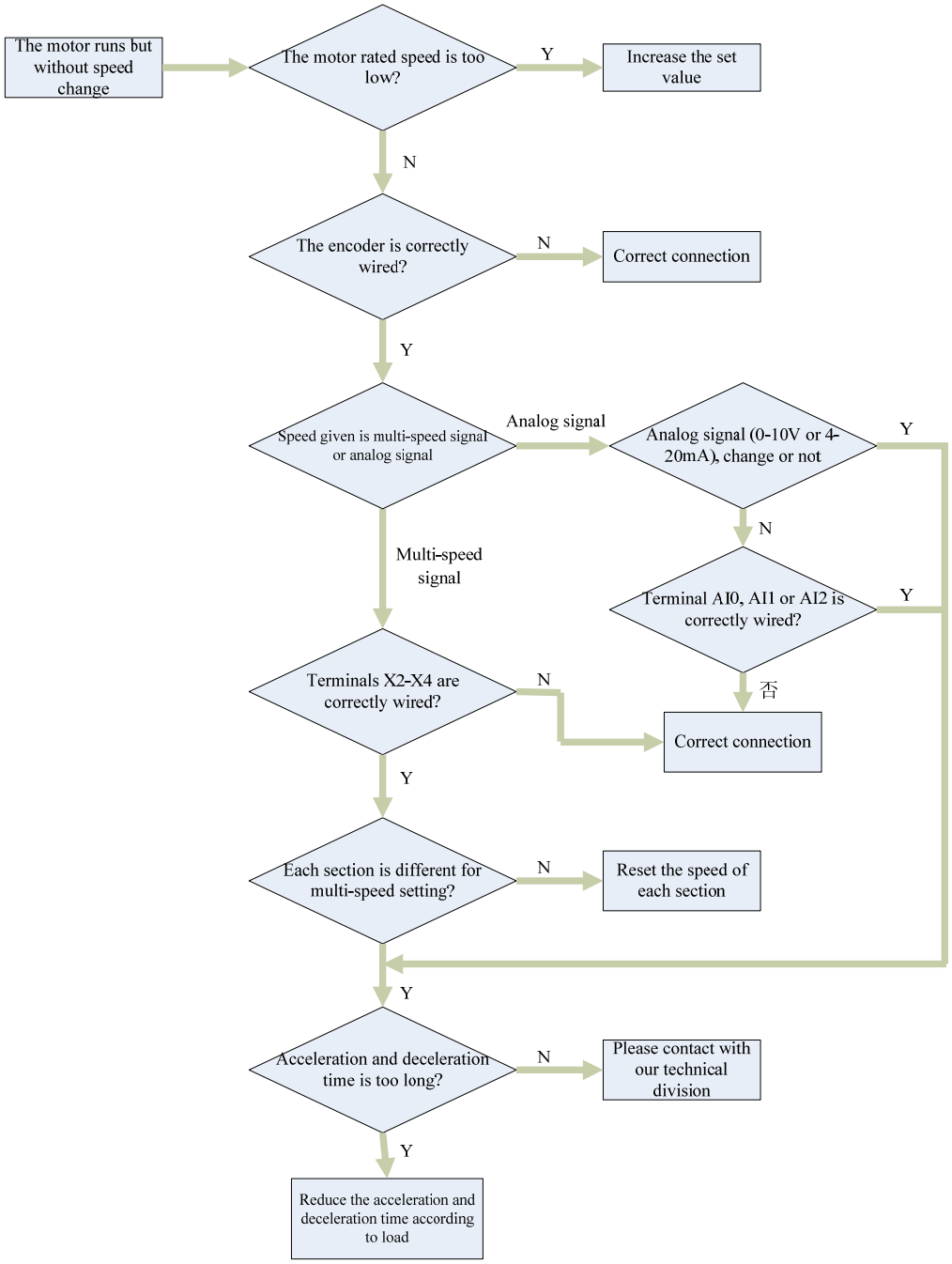
Because of the reasons of parameter setting, wrong wiring, inverter and motor might not run in a preset condition at first start. In this case please refer to the introduction in this section about the fault diagnosis procedure, to have fault analysis and handling.

Abnormal motor running:

■ Motor doesn't run when running command at control terminal block is sent.



■ Motor runs but doesn't have speed change.



# Chapter 9 Service and Maintenance

This chapter introduces the general information about service and maintenance.

**Danger**

◎ **Maintenance should be started 10 minutes after power off. The charge indicator should be fully off and DC bus voltage should be below 24 VDC.**

Or it may cause electric shock.

◎ **Never remould inverter unauthorizedly.**

Or it may cause electric shock and human injury

◎ **Only professional electrician can operate the product maintenance. Never leave any wire stubs, metal pieces inside the inverter.**

Or it may cause fire hazard.

**Notice**

◎ **Do not alter wiring and remove wiring terminal while power is on.**

Or it may cause electric shock

## 9.1 Warranty

Our company provides warranty service if inverter (main body) has the following situation:

Our company will be responsible for the repairs within the warranty period (counted date from leaving factory) if inverter has failure or damage in normal operation condition. An appropriate maintenance cost will be charged if the warranty period is due.

If the failure was caused by following reasons, a certain cost will occur even within warranty period:

1) Problem caused by not follow up instruction manual or unauthorized repair or alter

2) Problem caused by over specified limit usage

3) Drop the product or transport damage

4) Damage caused by earthquake, fire hazard, flood, lighting, abnormal voltage or other natural disasters, or its affiliate reason

## 9.2 Product Inquiry

If product damages, has fault or other problem, please contact to our office or customer service department and prepare the following information:

Inverter Model

Serial number

Date of purchase

Information needs to be provided: damage description, unclear question and fault occurred

## 9.3 Routine Check

Inverter hull can't be taken off during energizing or operation. To observe the state of operation can only go through visual check. The following items can be routinely checked:

1) Does ambient environment fulfill standard specification?

2) Does operation conform to the standard specification?

3) Any abnormal noise, vibration or others?

4) Proper working cooling fan installed in inverter?

5) Any over-heat situation?

## 9.4 Periodic Check

To start a periodic check, inverter should stop operating, switch off power, then remove the hull. The charging capacitor in main circuit may still have charged voltage and needs time to discharge it. Therefore the check operation can only start after charging indicator is off and DC bus voltage measured by multimeter is lower than safety value (below 24VDC).

There will be an electric shock hazard if you touch the terminal block right after power off.

Table 9-1 lists the items needed to be periodic check.

**Table 9-1 Periodic check item**

| Area | | Item | Method | Judgment |
|---|---|---|---|---|
| Operation environment | | 1) Ensure ambient temperature, humidity, vibration, check any dust, corrosive gas, oil mist or water drop, etc<br>2) Any dangerous goods in surrounding area | 1) Visual check, thermometer, hydrometer<br>2) Visual Check | 1) Ambient temperature lower than 40℃. Humidity and other environment index meet the requirements<br>2) No dangerous good |
| LCD display | | 1) Is LCD clearly displayed? Even backlight?<br>2) Any missing letter in screen? | Visual check | 1) Even backlight<br>2) Correct display |
| Connector<br>Terminal block, bolt | | 1) Loosening bolt<br>2) Loosening connector | 1) Tightening<br>2) Visual check | 1) Normal condition<br>2) Secured installation |
| Main circuit | Wire | 1) Shielded layer broken or faded<br>2) Deformed copper connector | Visual check | Normal condition |
| | Electromagnetic contactor, relay | 1) Has vibration sound in operation<br>2) Is contact point proper closed | Hearing check, visual check | 1) No<br>2) Can hear contactor closing |
| | Charging capacitor | 1) Any leaking, color change, crack and swollen enclosure<br>2) Does safety valve go out? Any swollen on it? | Visual check | Normal condition |
| | Heatsink | 1) Is dust piled up?<br>2) Air duct blocked or attached by foreign object | Visual check | Normal condition |
| | Cooling fan | 1) Any abnormal noise<br>2) Any abnormal vibration<br>3) Color changed due to overheat | 1) Hearing, visual check. Manual turn fan blade after power off.<br>2) Visual check<br>3) Visual check, olfaction check | 1) Rotating smoothly<br>2), 3) no abnormalities |
| Control circuit | Connection component | Any dust or attached foreign object on two row terminal strip between control board and main circuit | Visual check | Normal condition |
| | Control board | 1) Any color change or odor smell on control PCB<br>2) Any crack, damage, deform on PCB | 1) Visual Check, olfaction check<br>2) Visual check | Normal condition |

# Appendix A Inverter EMC Installation Guide

This appendix introduces EMC inverter design, installation from aspects of noise suppression, wiring requirement, grounding, peripheral equipment surge absorption, current leakage, install area dividing, installation precaution, using power filter, and radiation noise treatment.

## A.1 Noise Suppression

The principle of inverter decides that a certain noise may produce. The effect to the peripheral equipments depends on the type of noise, noise transmission path, design and installation of kinetic system, wiring and grounding.

### A.1.1 Types of Noise

Types of noise see Fig. A-1.

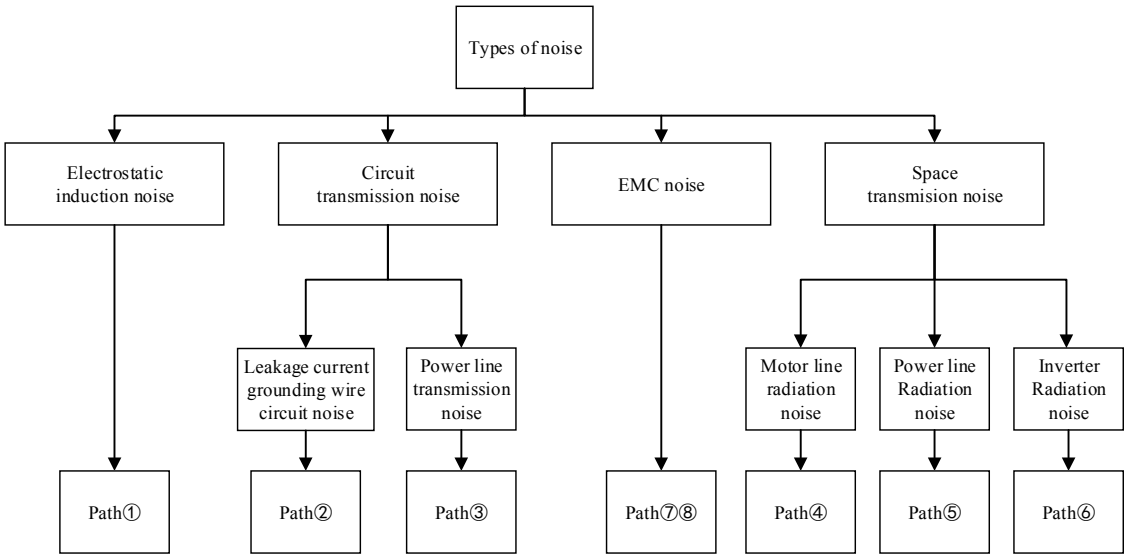



**Fig. A-1 Diagram for noise type**

### A.1.2 Noise Transmission Route

Noise transmission path see Fig. A-2.

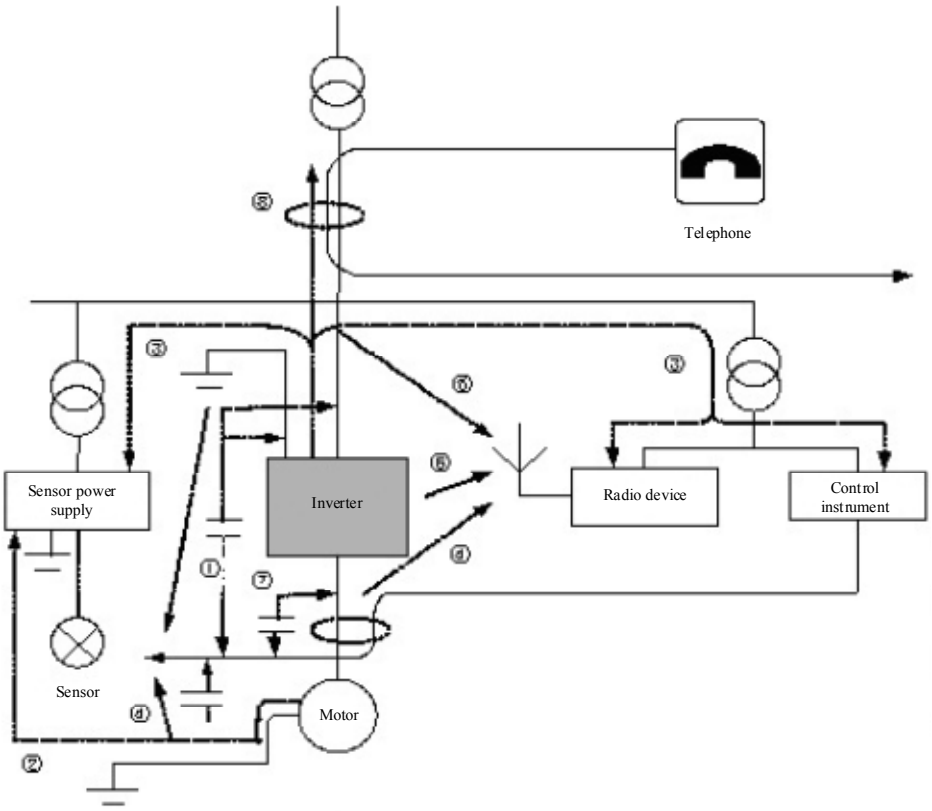



**Fig. A-2 Noise transmission route**

### A.1.3 Basic Method for Noise Suppression

Basic methods against noise suppression see Table A-1.

**Table A-1 Basic countermeasure for noise suppression**

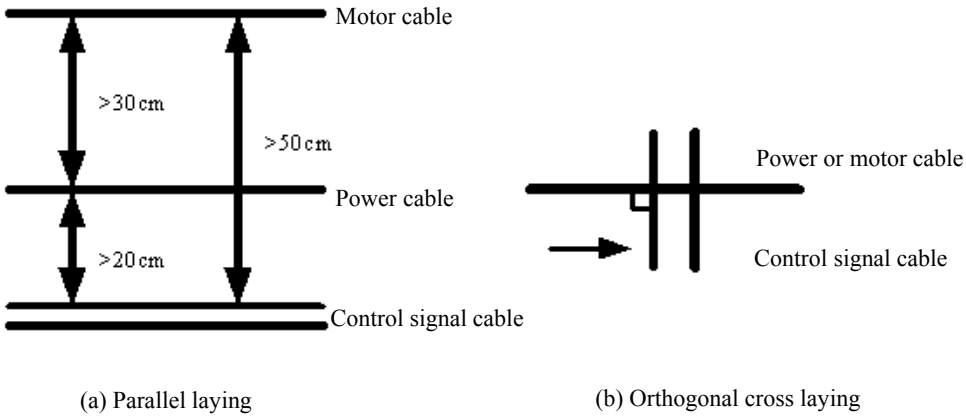
| No. | Cause | Countermeasure |
|---|---|---|
| ①<br>⑦<br>⑧ | If signal cable runs in parallel with power cable or they are bundled, noise will be transmitted in signal cable due to the electromagnetic induction and static induction. Peripheral device may be wrongly triggered. | 1) Avoid signal cable and power cable in parallel running, or bundled;<br>2) Keep susceptible peripheral device far away from inverter;<br>3) Lay easy affected signal cable far away from inverter input/output power cable;<br>4) Use shielded wire for signal cable and power cable. It is better to insert into metal tube separately (minimum 20 cm between metal tubes) |
| ② | If the peripheral device becomes a close loop circuit by wiring to inverter, the inverter grounding current leakage will cause wrong action of the peripheral device. | Don't ground the peripheral device can avoid the wrong action caused by current leakage |
| ③ | If the peripheral device shares the same power supply with inverter, noise created by inverter can be transmitted alone the power cable. The peripheral devices linked in the system may cause wrong action. | Install a noise filter at inverter input side, or use isolate transformer/power filter to other peripheral devices for noise isolation |

| | | |
|---|---|---|
| ④<br>⑤<br>⑥ | If weak current peripheral devices, such as control computer, gauges, radio device, sensor and their cable are installed in the same cabinet with inverter, and their wiring is closed to the inverter, radiate interference may cause wrong action. | 1) Easy affected peripheral devices and their cable should be installed far away from inverter. Shielded cable should be used for signal cable and shielded layer grounds to the earth. Signal cable inserts into metal tube and away from inverter and its input/output power cable. A perpendicular cross must be wired in case of inevitable cable crossing between signal cable and power cable.<br>2) To install radio noise filter or linear noise filter (Ferrite Common Mode Choke) on both input and output side of inverter can suppress radiated noise of inverter input and output power cable.<br>3) Cable from inverter to motor should be inserted into a thick shield of 2mm or thicker, or be buried in a cement groove. Cable should be inserted into a metal tube and its shield should be grounded (4 core cable can be taken for motor wiring, one core grounds to earth at inverter side and connects to the motor enclosure at the other end). |

# A.2 Wiring Requirement

## A.2.1 Requirement for Cable Laying

In order to avoid mutual coupling of interference, control signal cable should be laid separately from power cable and as far as possible from them. Fig. A-3(a) shows this situation. Fig. A-3(b) shows that a perpendicular cross must be ensured when a signal cable must pass a power cable of power supply or motor.




(a) Parallel laying (b) Orthogonal cross laying

**Fig. A-3 Wiring requirement**

## A.2.2 Requirement for Cable Cross Section Area

The larger the cable cross section is, the larger the earth capacitance, and the higher the ground current leakage will be. If the cross section of motor power cable is too large, motor should be used with decreased rating and reduces the output current (reduce 5% of current for each increasing level of cross section).

### A.2.3 Requirement for Shielded Cable

High frequency, low impedance, shielded armor cable, such as copper mesh, aluminum mesh, should be used.

### A.2.4 Installation Requirement for Shielded Cable

Normally control cable should be a shielded cable, and shielded metal mesh should be connected to metal cabinet by 360° ring type clamp fixed. Fig. A-4 shows the correct connection. Shielded connection shown in Fig. A-5 is wrong.

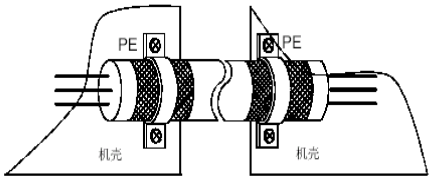



Fig. A-4 Correct shielded grounding

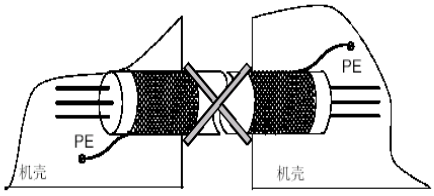



Fig. A-5 Incorrect shielded grounding

## A.3 Grounding

### A.3.1 Type of Grounding

Fig. A.6 lists the methods for electrode to ground.

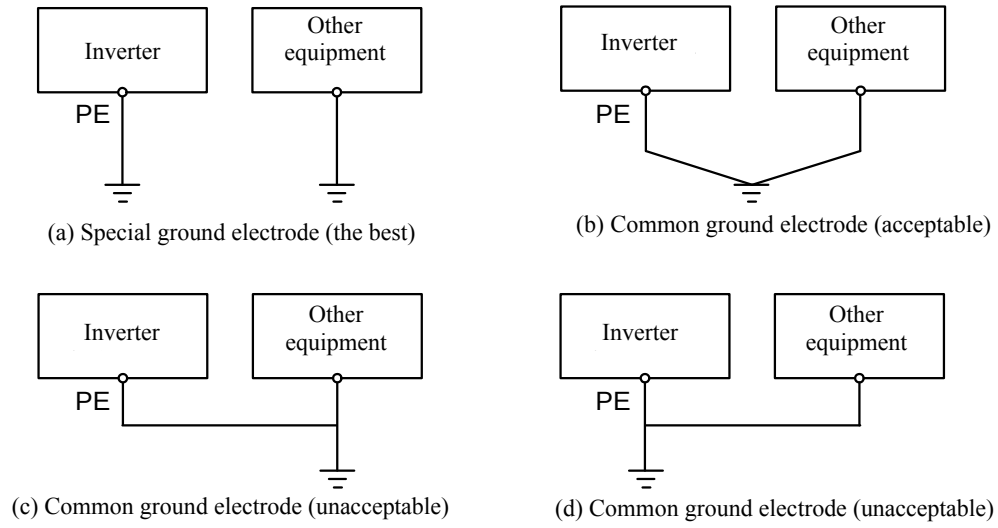



Fig. A-6 Diagram for special grounding

Mathod (a) is the best grounding method in above 4 connections. It is strongly suggested for users to adopt this grounding method.

### A.3.2 Precaution for Ground Wiring

1) Grounding cable must be selected to have a standard cross section in order to minimize the grounding impedance. Flat cable has less high-frequency impedance than round conductor cable, flat cable is better in this case if they have the same cross section area.

2) To have grounding cable as short as possible, and grounding spot should be connected to inverter as close as possible.

3) If motor takes 4-core cable, one core must be grounded at inverter side. Other end is connected to the motor grounding terminal. The best grounding solution is that both motor and inverter have their individual ground electrode.

4) If all grounding terminals of different parts in control system are connected together, noise may be created because of ground current leakage. It may affect the peripheral devices other than inverter. In the same control system, grounding for inverter and other weak current devices, such as computer, sensor or audio device, should be wired separately.

5) In order to acquire low high-frequency impedance, all equipment fix bolts can be taken as high-frequency terminal to connect the cabinet back panel. Be aware to remove insulating paint before installation.

6) Grounding cable should be laid away from the I/O wiring of noise sensitive device, and should keep short.

## A.4 Surge Absorber Installation

Relays, contactors and electromagnetic brakes can create large amount of noise. Surge absorber needs to be installed even those components aren't inside the inverter case. Wiring is shown in Fig. A-7.

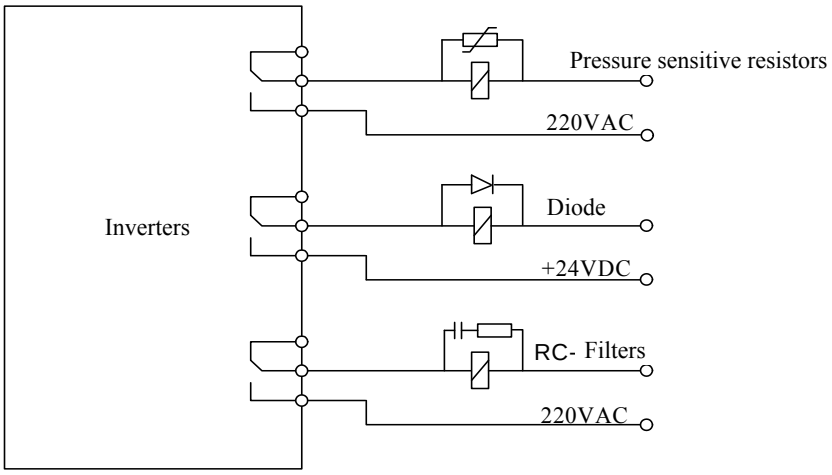



**Fig. A-7 Requirement for relay, contactor, EM brake**

## A.5 Leakage Current and Its Solution

Leakage current flows through the linear capacitor and motor capacitor at input/output side of inverter. Current as shown in Fig. A-8, includes ground leakage current and interline leakage current. The amount of leakage current is decided by the size of carrier frequency and capacitance.

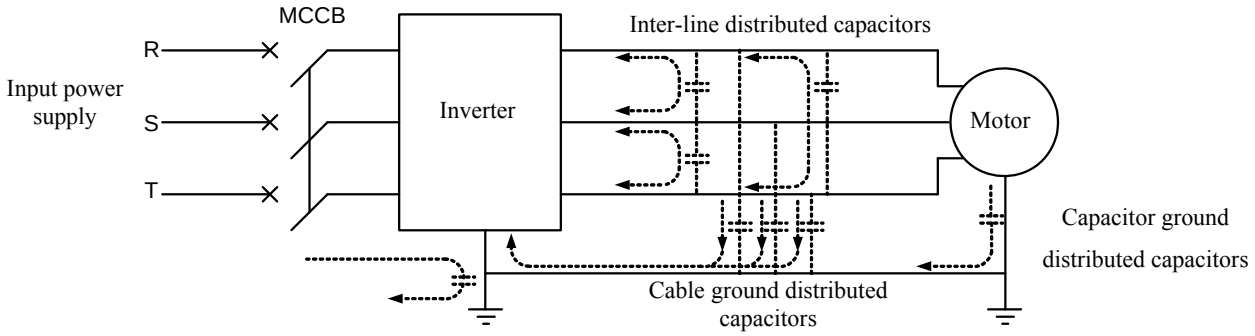



**Fig. A-8 Leakage current path**

### A.5.1 Ground Leakage Current

Besides inverter, ground leakage current can also flow into other devices by grounding cable. It might trigger the wrong action of leakage current breaker, relay or other devices. The higher the inverter carrier frequency, the longer the motor cable is, the higher the leakage current will be.

Suppression measure: lower carrier frequency; short motor cable, take special designed leakage breaker for ultraharmonics/surge.

### A5.2 Cable Inter-line Leaking

The leakage current flowed through distributed interline capacitors at inverter output side, may trigger the wrong action of external thermal relay due to its ultraharmonics. Especially for small inverter which capacity is below 7.5 KW, the long cable (more than 50m) causes increasing leakage current. External thermal relay is easy wrongly triggered.

Suppression measure: lower carrier frequency; install AC output reactor at output side; recommend to use temperature sensor and monitor the motor temperature directly, or to use electronic thermal relay for motor overload protect carried by inverter to replace external thermal relay.

## A.6 Radiation Suppression

Normally inverter is installed in a metal cabinet. Only minor radiation may affect the devices outside the metal cabinet. The main radiation source is the power cable connected externally. Since all inverter power cable, motor cable, control cable and keyboard wire need to be wired to outside of shielded cabinet, the outgoing position should be special handled, or shield will be invalid.

In Fig. A-9, part of cable inside the shielded cabinet plays as antenna. It picks up noise radiation in the cabinet and transmits to the outside air via cable. In Fig. A-10, wiring cable shielded layer to cabinet grounding at the outlet, noise radiation picked up in the cabinet will then flow into the earth directly via shielded cabinet, and will not affect the environment.

By using shielded layer grounding introduced in Fig. A-10, the place where cable shielded layer connects to the grounding cabinet should be close to the cable outlet, otherwise the unshielded cable between grounding point and outlet will still be functioned as antenna and have coupling affection. The distance between grounding point and outlet should be less than 15cm, the short, the better.

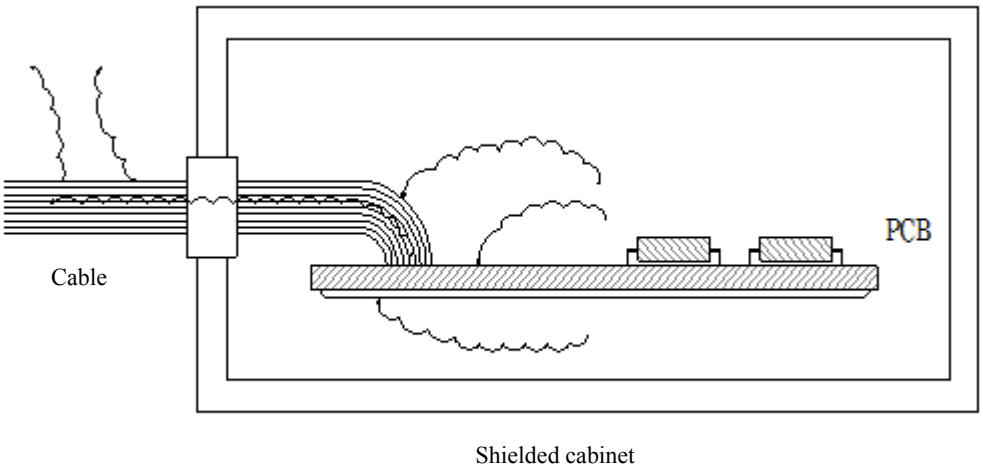



**Fig. A-9 Radiation brought by cables from shielded cabinet**

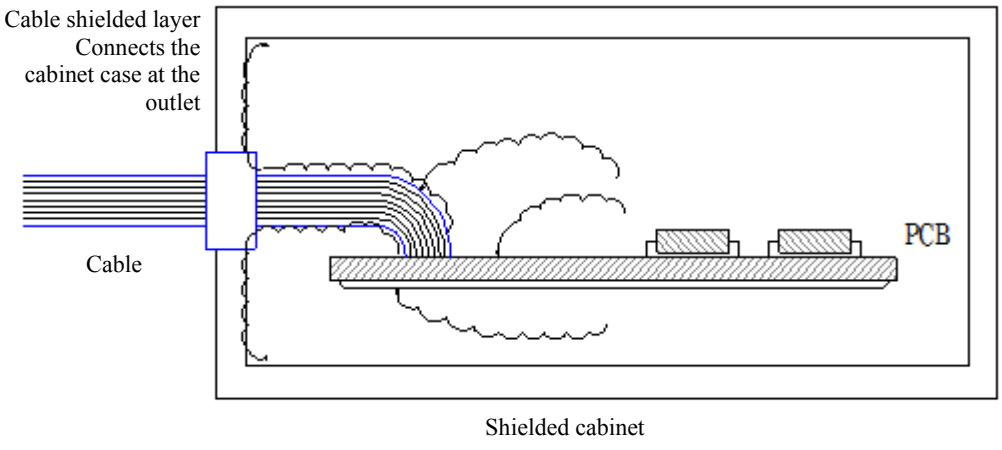



**Fig. A-10 Cable shielded layer connects to shielded cabinet and suppress the radiation**

## A.7 Power Cable Filter Guide

Devices which create strong interference or are sensitive to surrounding interference can use power cable filter.

### A.7.1 Function of Power Cable Filter

1) Power cable filter is a dual low-pass filter, it allows only DC and current with 50Hz. High frequency electromagnetic interference current is not allowed to pass. It can not only suppress electromagnetic interference created by device itself into the power cable, but also prevent interference on power cable into the device.

2) Power cable filter can meet both criterion for conduct emission and conduct susceptibility EMC. It can suppress the radiation interference at the same time.

### A.7.2 Precaution for Power Cable Filter Installation

1) In cabinet, filter should be installed to the inlet of power cable as close as possible. The filter power cable inside the cabinet should keep short.

2) If filter input and output cable are laid to close, high frequency interference will bypass the filter and start to couple directly. Power cable filter will lose the function.

3) Normally, there is a designated grounding terminal on filter enclosure. If only one conductor is used to connect filter grounding terminal to the cabinet, filter will not be properly functional due to the high frequency impedance of long conductor. The correct way is to attach the filter enclosure to the metal conductive surface of cabinet and possible keep the large contact area. Note to remove insulating paint, ensure good electrical contact.

## A.8 Installation Section Divide for EMC Inverter

In the driving system consist of inverter and motor, inverter and the peripheral devices, such as controller, sensors, are normally installed in the same cabinet. Control cabinet can suppress the outside interference by taking measures at the main conjunction. Therefore radio noise filter and input cable AC reactor should be installed at input cable terminal in control cabinet. To meet the EMC requirement, Electromagnetic Compatibility (EMC) should also be fulfilled inside the cabinet.

In the driving system consist of inverter and motor, inverter, brake unit and contactors are all sources of high noise intensity. It will affect the noise sensitive peripheral devices, such as automation equipments, encoder and sensors. Based on their electrical characteristics they can be installed in different EMC zones. The most effective measure to reduce interference is to separate the noise source and noise receiver in space. Fig. A-11 shows the division of inverter EMC installation zone.

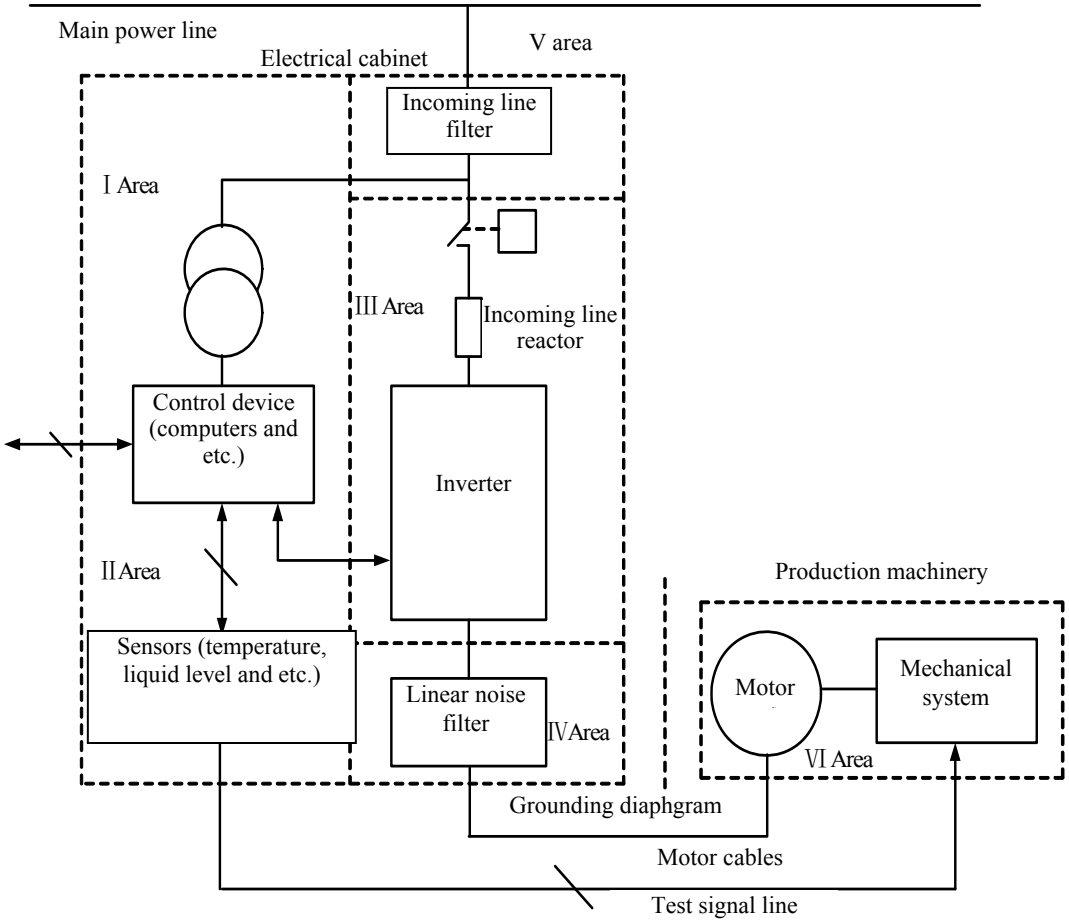



**Fig. A-11 Diagram for inverter EMC installation zone**

Above installation zones are described as follows:

Zone I: control power transformer, control device, sensors and etc.

Zone II: control signal cables and their connection, require certain ability for anti-interference

Zone III: major noise source includes incoming cable reactor, inverter, brake unit, contactors etc.

Zone IV: Output noise filter and its wiring

Zone V: Power supply (include wiring of radio noise filter)

Zone VI: Motor and its cable

Each zone must be separated and keep a minimum 20cm distance to avoid electromagnetic coupling. The grounded separator is the best to divide each zone for coupling. Cables in different zones should be inserted into individual cable ducts. When filter is required, it should be installed at entrance point of each zone. All bus cables (such as RS485) and signal cables from cabinet must be shielded.

## A.9 Precaution for Electrical Installation

Fig. A-12 shows the inverter electrical installation.

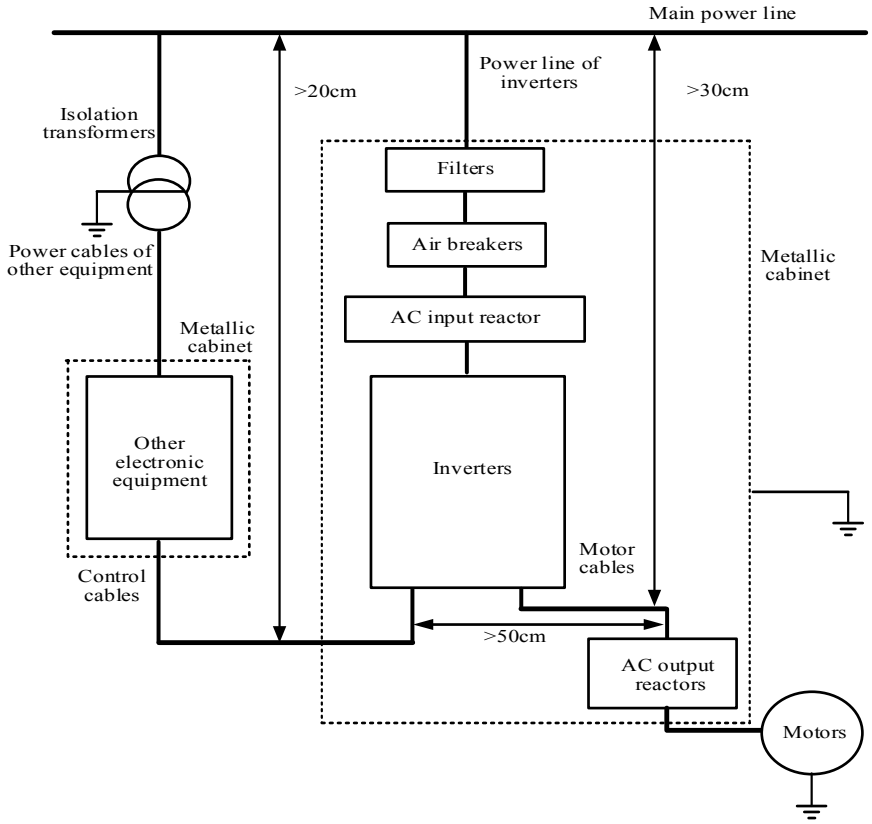



**Fig. A-12 Inverter electrical installation diagram**

To satisfy requirement of EMC, please note during installation:

1) Inverter should be installed inside the cabinet. Enclosure of devices, such as inverter back panel, input filter enclosure, all must be installed on the back of control cabinet firmly, and ensure having good electrical contact between them; to minimize the space between inverter and filter, a space less than 15cm can maximum reduce the grounding cable high frequency impedance between inverter and input filter, reduce high frequency noise.

2) At entrance of control cabinet (not more than 5 cm from the outlet) installs a wide grounding block. To ensure a good electrical contact, all input, output cable shielded layers should be connected to the grounding block and fixed by 360° ring type clamp.

3) Motor cable must use shielded cable, and the best to have metal interlocked conduit, or double layers of metal mesh shielded cable. The 360° ring type clamp (such as Fig. A.4) must be used as metal cable clamp to fix the shielded layer of motor cable at inverter side to the back board of cabinet. There are two fixing locations: one is to close the inverter (the best is less than 15 cm), other location is to fix it on the ground block. 360° ring type connection should be taken to connect the motor metallic case

when shielded layer of motor cable goes through the motor terminal box at motor side. If this type of connection is hard to do, the shielded layer can be braided, stretched and connected to the motor ground terminal. The stretched width should be greater than 1/5 of the braid length. The length of motor cable core and cable from PE flexible pipe should be as short as possible. The best is to keep it less than 5 cm.

4) Shielded cable must be taken for terminal block control cable. Its shielded layer should be connected to the ground block at the cabinet entrance and taken 360° ring type metal clamp. At inverter side shielded layer can be fixed on inverter metal case by using metal cable clamp. If that way is difficult to use, the shielded layer can be woven to a broad and short braid, and connect to the PE terminals after stretched. The best length of cable core and cable from PE flexible pipe should keep less than 15 cm.

5) Keyboard cable can't go out of the shielded cabinet.

6) The holes or seams on shielded cabinet should keep small and not more than 15cm.

## A.10 EMC Standard Fulfilled by AS450 Series Inverter

AS450 series common vector inverter can meet the EMC standard as shown in Table A-2 after installing proper I/O filter, AC reactor (refer to the ACCESSORIES SELECTION for the proper type of filter and reactor) and following above mentioned wiring precautions.

**Table A-2 AS450 series common vector inverter EMC performance summary**

| Item | Criteria | Level of satisfying criteria |
|---|---|---|
| Conducted harassment emission | EN12015.1998 | 0.15≤*f*＜0.50*MHz*, 100*dB*(*μv/m*) ——Quasi-peak valu<br>0.50≤*f*＜5.0*MHz*, 86*dB*(*μv/m*) ——Quasi-peak valu<br>5.0≤*f*＜30*MHz*, 90~70*dB*(*μv/m*) ——Quasi-peak valu |
| Radiated harassment emission | EN12015.1998 | 30≤*f*＜230*MHz*, 40*dB*(*μv/m*) ——Quasi-peak valu<br>230≤*f*＜1000*MHz*, 47*dB*(*μv/m*) ——Quasi-peak valu |
| Electrostatic discharge immunity | EN12016.2004 | Criteria B (contact discharge 4000V, air discharge 8000V) |
| Radiated electromagnetic field immunity | EN12016.2004 | Level 3 Criteria A(3V/m) |
| Electrical Fast Transient (EFT) Immunity | EN12016.2004 | Level 4 Criteria B (heavy current end ±2KV/2.5kHz) |
| Surge immunity | EN12016.2004 | Criteria B(±1KV) |
| Conducted immunity | EN12016.2004 | Criteria A(3V,0.15～80MHz) |

# Appendix B Standard Compatibility

**(1) European Low Voltage Directive**

AS450 series inverter complies with the standard of EN61800-5-1:2007, and its clause of Low Voltage Directive 2006/95/EC.

**This inverter complies also the following standard:**

**EN61800-5-1:2007: Adjustable speed electrical power drive systems –Part 5-1: Safety requirements-Electrical, thermal and energy.**

CE

**(2) European EMC Regulations**

AS450 series inverter meets the following EMC standards once you start to install the product according the recommendation provided by this handbook.

**EN12015.1998 Electromagnetic compatibility-Product family standard for lifts, escalators and passenger conveyors-Emission.**

**EN12016.2004 Electromagnetic compatibility-Product family standard for lifts, escalators and passenger conveyors-Immunity.**

**EN61800-3:2004: Power Drive Category D3.**

TÜV C NRTL US

**(3) ISO9001 Quality Management System**

**Shanghai Sigriner STEP Electric Co., Ltd executes the quality management according the standard of ISO9001.**

# Appendix C Modbus Communication Protocol

The inverter whose Modbus address is set as hexademical number system:

**Modbus address** of register = register address + 0x999A

**Modbus address** of register bit = register address*16 + bit No. n (n=0… 15)

**Modbus address** of inverter parameter = parameter No. expressed in hexademical (for example, Modbus address of P10.23: 0x1023)

The inverter whose Modbus address is set as decimal number system:

**Modbus address** of register = register address + 10000

**Modbus address** of register bit = register address*16 + bit No. n (n=0… 15)

**Modbus address** of inverter parameter = parameter No. expressed in demical (for example, Modbus address of P10.23: 1023)

## C.1 Command Data [registers 3 and 6] [bits 1 and 5]

Read the register in this table with function code 3, write the register in this table with function code 6

Read the bit in this table with function code 1, write the bit in this table with function code 5

| Register address | Contents |
|---|---|
| 0000H | Communication control word<br>bit0 1: FWD 0: invalid<br>bit1 1: REV 0: invalid<br>bit2 1: run 0: stop<br>bit3 reserved (1: with external fault)<br>bit4 1: reset fault command<br>bit7~5 reserved (multi-speed selection # attached table Z-1)<br>bit8 reserved (1: valid inching frequency #)<br>bit10~9 acceleration and deceleration time selection 0: curve 1 1: curve 2<br>bit11 reserved (1: lockout base #)<br>bit12 1: select running and given command 2 0: select running and given command 1<br>bit13 1: select PID parameter group 2 0: select PID parameter group 1<br>bit15~14 not used* |
| 0001H | Modbus target frequency given value, communication given value<br>0~30000: 0.00~300.00Hz |
| 0002H | Reserved (Modbus current frequency given value)<br>IQ10(1.0): rated frequency |
| 0003H | Reserved (Modbus PID given value)<br>10000 corresponds to 100% given quantity |
| 0004H | Reserved (Modbus PID target value validity 1: valid 0: invalid) |

| | |
|---|---|
| 0005H | Reserved (AO1 output value)<br>-1024~1024: -5.00~5.00V |
| 0006H | Reserved (AO2 output value)<br>-1024~1024: -5.00~5.00V |
| 0007H | Multifunctional port output#<br>bit0 1: DO0 (relay A) ON 0: OFF<br>bit1 1: DO1 (relay B) ON 0: OFF<br>bit2 1: DO2 ON 0: OFF<br>bit3 1: DO3 ON 0: OFF<br>bit4 1: DO4 (OC) ON 0: OFF<br>bit5 1: DO5 (OC) ON 0: OFF<br>bit6 not used<br>bit7 not used<br>bit15~8 not used<br>*# actual terminal output value = Modbus set value \| internal output value of function terminal* |
| 0008H | Reserved (validity of Modbus broadcast data)<br>bit0 1: valid Modbus broadcast given of terminal DI0 0: invalid<br>bit1 1: valid Modbus broadcast given of terminal DI1 0: invalid<br>bit2 1: valid Modbus broadcast given of terminal DI2 0: invalid<br>bit3 1: valid Modbus broadcast given of terminal DI3 0: invalid<br>bit4 1: valid Modbus broadcast given of terminal DI4 0: invalid<br>bit5 1: valid Modbus broadcast given of terminal DI5 0: invalid<br>bit6 1: valid Modbus broadcast given of terminal DI6 0: invalid<br>bit7 1: valid Modbus broadcast given of terminal DI7 0: invalid<br>bit8 not used<br>bit9 not used<br>bit10 1: valid target frequency broadcast given value 0: invalid<br>bit11 1: valid current frequency broadcast given value 0: invalid<br>bit12 1: valid running command broadcast given value (FWR, REV, start, stop)<br>bit15~13 not used |
| 0009H | Reserved (target frequency broadcast given value) |
| 000AH | Reserved (current frequency broadcast given value) |
| 000BH | Reserved (running signal broadcast given value)<br>bit0 Modbus broadcast given value # of terminal DI0 (the corresponding specific function is set by the parameter )<br>bit1 Modbus broadcast given value # of terminal DI1 (the corresponding specific function is set by the parameter)<br>bit2 Modbus broadcast given value # of terminal DI2 (the corresponding specific function is set by the parameter)<br>bit3 Modbus broadcast given value # of terminal DI3 (the corresponding specific function is set by the parameter)<br>bit4 Modbus broadcast given value # of terminal DI4 (the corresponding specific function is set by the parameter) |

| | |
|---|---|
| | bit5 Modbus broadcast given value # of terminal DI5 (the corresponding specific function is set by the parameter)<br>bit6 Modbus broadcast given value # of terminal DI6 (the corresponding specific function is set by the parameter)<br>bit7 Modbus broadcast given value # of terminal DI7 (the corresponding specific function is set by the parameter)<br>bit8 not used<br>bit9 not used<br>bit10 1: FWD 0: invalid<br>bit11 1: REV 0: invalid<br>bit12 1: run 0: stop<br>bit13 1: external fault<br>bit14 1: reset fault command<br>bit15 not used<br>*# adopted value of the function input terminal = (Modbus broadcast value & broadcast given validity \| actual input value of function terminal* |
| 000CH~0018H | Reserved (broadcast data) |
| 0019H | Virtual input terminals<br>bit0: virtual terminal X0<br>bit1: virtual terminal X1<br>bit2: virtual terminal X2<br>bit3: virtual terminal X3<br>bit4: virtual terminal X4<br>bit5: virtual terminal X5<br>bit6: virtual terminal X6<br>bit7: virtual terminal X7<br>bit8~15: reserved<br>*#actual terminal input value = Modbus set value \| input value of outer terminal* |
| 001AH~0068H | Reserved control word (79 spaces)<br>001AH: communication given torque -1000~1000 → -100.0%~100.0% motor rated torque<br>001BH: speed limit value 0~40000 → 0.00~400.00Hz |
| 0069H | Parameter update request<br>After the parameter is received from the inverter via Modbus, it is saved in its parameter image area.<br>0x55: update the actual parameter in RAM by use of that in image area.<br>0xAA: update the actual parameter in RAM by use of the default factory parameter.<br>0: no update.<br>[Note]: the unit is automatically cleared after every update. |
| 006AH~01F9H | Reserved (parameter) |
| 01FAH~046FH | Reserved 630 spaces |

## C.2 Monitoring Data [register 4] [bit 2]

Read the register in this table with function code 4 and read the bit in this table with function code 2.

| Register address | Contents |
|---|---|
| 0470H | Status word of the inverter status<br>bit0 1: with running signal 0: no running signal<br>bit1 1: in service<br>bit2 1: in zero speed<br>bit3 1: in forward 0: in reverse<br>bit4 1: normal power-on of the inverter 0: abnormal power-on of the inverter<br>bit5 1: in lockout base<br>bit6 not used<br>bit7 1: in fault<br>bit8 reserved (1: in fault retry)<br>bit9 reserved (1: wrong parameter setting)<br>bit10 1: in self-tuning<br>bit11 1: request self-tuning<br>bit15~12 not used |
| 0471H | Detection status<br>bit0 1: frequency detection LF, frequency ≤ detection frequency<br>bit1 1: frequency detection GF, frequency ≥ detection frequency<br>bit2 1: frequency detection EF, given and feedback frequency in detection frequency band<br>bit3 1: speed arrive<br>bit4 reserved (1: in analog signal given frequency command loss)<br>bit5 1: in over-torque detection<br>bit6 1: in undervoltage detection<br>bit7 1: bus voltage greater than 85% rated voltage<br>bit8 1: exceeding 5% rated current during running, exceeding 10% rated current during stop<br>bit9 1: fault forecast<br>bit15~10 not used |
| 0472H | Reserved (given target frequency) |
| 0473H | Current running frequency<br>5000 corresponding to 50.00Hz |
| 0474H | Reserved (PID given value) |
| 0475H | Reserved (PID feedback value) |
| 0476H | Reserved (PID output value) |
| 0477H | Reserved (PID proportional item) |
| 0478H | Reserved (PID integral item) |
| 0479H | Reserved (PID differential item) |
| 047AH | Reserved (communication fault)<br>bit0 1: communication overtime |

| | |
|---|---|
| | bit1 1: frame format<br>bit2 1: CRC error<br>bit3 1: data length error<br>bit4 1: odd-even check error<br>bit5 1: overload error<br>bit6 1: illegal command<br>bit7 reserved (manipulator communication fault)<br>bit15~8 not used |
| 047BH | Parameter updating status<br>bit0 1: in updating 0: update completed<br>bit1 reserved (1: data exceeding limit)<br>bit2 reserved (1: data mismatched)<br>bit3~15 not used |
| 047CH~0484H | Not used (9 units) |
| 0485H | Inverter output monitoring 1<br>bit0 1: normal power-on 0: abnormal power-on<br>bit1 1: fault 0: normal<br>bit2 1: running signal 0: no running signal<br>bit3 1: frequency/speed arrive signal<br>bit4 1: consistent frequency/speed<br>bit5 1: in zero speed<br>bit6 1: DC bus voltage greater than 85% rated voltage<br>bit7 1: exceeding 5% rated current during running, exceeding 10% rated current during stop<br>bit8 1: in self-tuning<br>bit9 1: speed detection 1<br>bit10 1: speed detection 2<br>bit11 1: fault forecast<br>bit12 1: self-tuning request |
| 0486H | Reserved (inverter output monitoring 2) |
| 0487H | Reserved (inverter output monitoring 3) |
| 0488H | Reserved (inverter output monitoring 4) |
| 0489H | Water pump output monitoring 1<br>bit0 1: water pump sleep<br>bit1 1: motor 1 start<br>bit2 1: motor 2 start<br>bit3 1: motor 3 start<br>bit4 1: motor 4 start<br>bit5 1: motor 5 start<br>bit6 1: motor 6 start<br>bit7 reserved (Y8)<br>bit8 reserved (Y9)<br>bit9 reserved (Y10)<br>bit10 reserved (Y11)<br>bit11 reserved (Y12) |

| | |
|---|---|
| | bit12 reserved (Y13)<br>bit13 reserved (Y14)<br>bit14 reserved (Y15)<br>bit15 reserved (Y16) |
| 048AH | Water pump output monitoring 2<br>bit0 reserved (Y17)<br>bit1 reserved (Y18)<br>bit2 reserved (Y19)<br>bit3 reserved (Y20)<br>bit4 reserved (Y21)<br>bit5 reserved (Y22)<br>bit6 reserved (Y23)<br>bit7 reserved (Y24)<br>bit8 reserved (Y25)<br>bit9 reserved (Y26)<br>bit10 reserved (Y27)<br>bit11 reserved (Y28)<br>bit12 reserved (Y29)<br>bit13 reserved (Y30)<br>bit14 reserved (Y31)<br>bit15 reserved (Y32) |
| 048BH | Fault indication 1<br>bit0 module overcurrent protection<br>bit1 ADC fault<br>bit2 radiator overheat<br>bit3 braking unit failure<br>bit4 reserved<br>bit5 reserved<br>bit6 speed variation<br>bit7 bus overvoltage<br>bit8 bus undervoltage<br>bit9 output phase loss<br>bit10 motor low speed overcurrent<br>bit11 encoder fault<br>bit12 reserved<br>bit13 reserved<br>bit14 reserved<br>bit15 motor phase sequence error |
| 048CH | Fault indication 2<br>bit0 overspeed in the same direction<br>bit1 overspeed in the opposite direction<br>bit2 reserved<br>bit3 encoder communication fault<br>bit4 abc overcurrent |

| | |
|---|---|
| | bit5 brake detection fault<br>bit6 input overvoltage<br>bit7 reserved<br>bit8 reserved<br>bit9 no self-learning of the encoder<br>bit10 output overcurrent<br>bit11 SINCOS encoder fault<br>bit12 input phase loss<br>bit13 overspeed protection<br>bit14 motor high speed overcurrent<br>bit15 grounding protection |
| 048DH | Fault indication 3<br>bit0 capacitor ageing<br>bit1 external fault<br>bit2 reserved<br>bit3 reserved<br>bit4 current sensor fault<br>bit5 braking resistor short circuit<br>bit6 too large instantaneous current value<br>bit7 output contactor fault<br>bit8 brake switch fault<br>bit9 IGBT short circuit protection<br>bit10 communication fault<br>bit11 abnormal input power<br>bit12 reserved<br>bit13 reserved<br>bit14 reserved<br>bit15 reserved |
| 048EH | Reserved (fault indication 4)<br>bit15~0 reserved |
| 048FH | Multifunctional terminal input status<br>bit0 1: multifunctional terminal X0 ON 0: OFF<br>bit1 1: multifunctional terminal X1 ON 0: OFF<br>bit2 1: multifunctional terminal X2 ON 0: OFF<br>bit3 1: multifunctional terminal X3 ON 0: OFF<br>bit4 1: multifunctional terminal X4 ON 0: OFF<br>bit5 1: multifunctional terminal X5 ON 0: OFF<br>bit6 1: multifunctional terminal X6 ON 0: OFF<br>bit7 1: multifunctional terminal X7 ON 0: OFF<br>bit8 not used<br>bit9 not used<br>bit15~10 not used |
| 0490H | Multifunctional terminal output status<br>bit0 1: K1 ON 0: OFF |

| | |
|---|---|
| | bit1 1: K2 ON 0: OFF<br>bit2 1: Y0 ON 0: OFF<br>bit3 1: Y1 ON 0: OFF<br>bit4 1: Y3 (K3) ON 0: OFF<br>bit5 1: Y4 (K4) ON 0: OFF<br>bit6 not used<br>bit7 not used<br>bit15~8 not used |
| 0491H | Feedback speed (Hz) -30000~30000 → -300.00~300.00Hz |
| 0492H | Given speed -30000~30000 → -300.00~300.00Hz |
| 0493H | Given speed filtering value |
| 0494H | Output voltage effective value |
| 0495H | Output current effective value |
| 0496H | Output torque -1000~1000 → -100.0%~100.0% inverter rated current |
| 0497H | Driver efficiency |
| 0498H | Bus voltage |
| 0499H | Analog input AI0/TM motor temperature detection input -10000~10000→-10.000~10.000V |
| 049AH | Analog input AI1 -10000~10000→-10.000~10.000V |
| 049BH | Analog input AI2 (reserved) |
| 049CH | System time |
| 049DH | Radiator temperature |
| 049EH | Phase U voltage (instantaneous value) |
| 049FH | Phase V voltage (instantaneous value) |
| 0490H | Phase W voltage (instantaneous value) |
| 04A1H | Phase U current (instantaneous value) |
| 04A 2H | Phase V current (instantaneous value) |
| 04A 3H | Phase W current (instantaneous value) |
| 04A 4H | Output active power |
| 04A 5H | Total output power |
| 04A 6H | Reactive power |
| 04A 7H | Power factor |
| 04A 8H | Feedback speed (rpm) -9999~9999→-999.9~999.9 |
| 04A 9H | Pre-torque |
| 04AAH~04B9H | Reserve 16 units |
| 04BAH~04D9H | View[0~31]: The specific monitoring contents are related to the inverter model. Please refer to “select LCD display data content” in the Inverter Instructions.<br>04BAH: View[0]//no-definition<br>04BBH: View[1]<br>04BCH: View[2]<br>04BDH: View[3]<br>04BEH: View[4]<br>04BFH: View[5]<br>04C0H: View[6] |

| | |
|---|---|
| | 04C1H: View[7]<br>04C2H: View[8]<br>04C3H: View[9]<br>04C4H: View[10]<br>04C5H: View[11]<br>04C6H: View[12]<br>04C7H: View[13]<br>04C8H: View[14]<br>04C9H: View[15]<br>04CAH: View[16]<br>04CBH: View[17]<br>04CCH: View[18]<br>04CDH: View[19]<br>04CEH: View[20]<br>04CFH: View[21]<br>04D0H: View[22]<br>04D1H: View[23]<br>04D2H: View[24]<br>04D3H: View[25]<br>04D4H: View[26]<br>04D5H: View[27]<br>04D6H: View[28]<br>04D7H: View[29]<br>04D8H: View[30]<br>04D9H: View[31] |
| 04DAH~04E5H | Uxx monitoring data (curve data)<br>04DAH: U01 data value (curve 1)<br>04DBH: U02 data value (curve 2)<br>04DCH: U03 data value (curve 3)<br>04DDH: U04 data value (curve 4)<br>04DEH: U05 data value (curve 5)<br>04DFH: U06 data value (curve 6)<br>04E0H: U07 data value (curve 7)<br>04E1H: U08 data value (curve 8)<br><br>04E2H: low byte: U01 logo (curve 1 configuration); high byte: U02 logo (curve 2 configuration)<br>04E3H: low byte: U03 logo (curve 3 configuration); high byte: U04 logo (curve 4 configuration)<br>04E4H: low byte: U05 logo (curve 5 configuration); high byte: U06 logo (curve 6 configuration)<br>04E5H: low byte: U07 logo (curve 7 configuration); high byte: U08 logo (curve 8 configuration) |
| 04E6H~04E9H | Reserve 4 units (for the driver) |

| | | |
|---|---|---|
| 04EAH~05E9H | Phase U current (buffer 256 points, for graphical display) [take sample once every 10 PWM periods] | |
| 05EAH~06E9H | Phase V current (buffer 256 points, for graphical display) | |
| 06EAH~07E9H | Phase W current (buffer 256 points, for graphical display) | |
| 07EAH | Output torque (for graphical display) | |
| 07EBH | Given speed (for graphical display) | |
| 07ECH | Feedback speed (for graphical display) | |
| 07EDH | Bus voltage (for graphical display) | |
| 07EEH~09EDH | Reserve 512 spaces (for graphical display) | |
| 0A34H~0A38H | Historical fault 0 (the earliest) | Fault code |
| | | Actual speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Given speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Bus voltage at faulty moment |
| | | Current at faulty moment |
| 0A39H~0A3DH | Historical fault 1 | Fault code |
| | | Actual speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Given speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Bus voltage at faulty moment |
| | | Current at faulty moment |
| 0A3EH~0A42H | Historical fault 2 | Function code |
| | | Actual speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Given speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Bus voltage at faulty moment |
| | | Current at faulty moment |
| 0A43H~0A47H | Historical fault 3 | Function code |
| | | Actual speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Given speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Bus voltage at faulty moment |
| | | Current at faulty moment |
| 0A48H~0A4CH | Historical fault 4 | Function code |
| | | Actual speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Given speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Bus voltage at faulty moment |
| | | Current at faulty moment |
| 0A4DH~0A51H | Historical fault 5 | Function code |
| | | Actual speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Given speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Bus voltage at faulty moment |
| | | Current at faulty moment |
| 0A52H~0A56H | Historical fault 6 | Function code |
| | | Actual speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Given speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Bus voltage at faulty moment |

| | | |
|---|---|---|
| | | Current at faulty moment |
| 0A57H~0A5BH | Historical fault 7 (the latest) | Function code |
| | | Actual speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Given speed at faulty moment -30000~30000→-300.00~300.00Hz |
| | | Bus voltage at faulty moment |
| | | Current at faulty moment |

# Customer Complaint

| | |
|---|---|
| Customer Name: | |
| Tel： | Fax： |
| Complaint Category: □Marketing □Publicity □Service □Quality □Business □Product □Others | |
| Complaints： | |
| The Complainant (Signature):<br>Complaints Unit(Official Seal):<br>Date： | |

# Product Warranty Card

| | |
|---|---|
| Customer Name： | |
| Tel： | Fax： |
| Warranty Product： | |
| Warranty Content： | |
| Warranty Person(Signature):<br>Warranty Unit(OfficialSeal):<br>Date： | |

# Warranty Agreement

1. Warranty period of the product is 18 months (bar code information on the inverter shall prevail). During the warranty, if the product has any fault or damage during its normal use according to the operation instruction, the company will provide free repair.

2. During the warranty, if the product is damaged due to one of the following reasons, a certain maintenance fee will be charged:

A. Machine damage due to improper use and arbitrary repair or modification;

B. Machine damage due to fire, flood, abnormal voltage, other natural disaster and secondary disaster;

C. Hardware damage due to artificial fall and transportation after purchase;

D. Machine damage caused by improper operation not following the user manual provided by the company;

E. Fault and damage caused by the obstacle other than the machine (such as external equipment factor);

3. When the product has any fault or damage, please correctly fill in the Product Warranty Card in details.

4. Collection of maintenance fee will be based on the latest Maintenance Price List.

5. Typically the warranty card won't be reissued, please be sure to reserve it and show it to the maintenance personnel during warranty.

6. If you have any problem during service, please timely contact our agent or the company.

7. Power of interpretation of the agreement shall be owned by Shanghai Sigriner STEP Electric Co., Ltd.

**Shanghai Sigriner STEP Electric Co., Ltd**

**(Customer service center) service hotline: 400-821-0325**

**Address: 1560# Siyi road, Jiading district, Shanghai**

**Postcode: 201801**

**Tel.: 021-69926000**

**Fax: 021-69926000**

**Website: http://www.stepelectric.com**

# Notice to Customers

Dear customers:

RoHS is the abbreviation for *the restriction of the use of certain hazardous substances in electrical and electronic equipment* which was implemented by EU on July 1st, 2006. It stipulates that in the newly developed electrical and electronic equipment, the following six hazardous substances are restricted: lead, mercury, cadmium, hexavalent chrome, PBB and PBDE.

In China, *the Electronic Information Products Pollution Control Management Measures* was issued on February 28th, 2006 jointly by the Ministry of Information Industry, State Development and Reform Commission, Ministry of Commerce, General State Administration for Industry and Commerce, Administration of Customs of the P.R.C, General Administration of Quality Supervision, Inspection and Quarantine and State Bureau of Environmental Protection, became a RoHS direction of Chinese Version and was enforced. On February 1st, 2008, *electronic waste environmental pollution prevention and control management measures* issued by the State Bureau of Environmental Protection of the P.R.C began to be executed, clearly specifying that the users of electronic and electrical products shall provide or entrust the electronic waste to be disassembled and disposed by the qualified company (including small individual businesses) with corresponding business scope listed in directory (or temporary directory).

All electronic components, PCB filters, wire straps, structural parts used in our products are selected and purchased by following *the Electronic Information Products Pollution Control Management Measures* and RoHS directive. The six hazardous substances (lead, mercury, cadmium, hexavalent chrome, PBB and PBDE), are strictly controlled. During manufacturing PCB components are welded on a XinChi lead free welding production line with a lead free welding technology.

Hazardous substances may be contained in the following assemblies:

| **Type of assembly** | Electronic components | PCB Board | Metal sheet | Radiator | Plastic piece | Conductor |
|---|---|---|---|---|---|---|
| **Possible hazardous substances** | Six hazardous substances: lead, mercury, cadmium, hexavalent chrome, PBB and PBDE | | | | | |

1) Environment analysis: Our electronic products will produce some heat in operation, which may lead the spread of little amount of hazardous substances. It will not cause any serious consequence for ambient environment. Once the life cycle of those electronic products is end and the product is discarded, the heavy metal and chemical hazardous substances contained in the products may seriously contaminate the soil and water resource.

2) Life cycle of electronic products and devices: Any electronic products and devices has its life

cycle and will be discarded, replaced and upgraded by a new product, even it is still functional. The life cycle of our company electronic products is generally not more than 20 years.

3) Electronic products discard treatment: If the discarded electronic products aren't treated properly, it may contaminate the environment. Our customers are required to follow up the related national regulation and set up a reclaiming system. It can't be discarded as a regular household refuse or solid industrial wastes. The discarded products shall be stored in an environment-friendly way, or reclaimed by qualified company, and should be strictly complied with the *electronic waste environmental pollution prevention and control management measures* issued by the State Bureau of Environmental Protection of the P.R.C. Any unqualified individual or company is prohibited in disassembling, utilizing, disposing of electronic wastes.

Please don't throw away the electronic waste together with your ordinary domestic waste. Please call local waste disposing agencies or environment protection agencies for the advice of proper electronic waste handling.

**Shanghai STEP Electric Corporation**